

First Edition 1974

Present Edition 2019

BANGLADESH
AGRICULTURAL SCIENCES ABSTRACTS
ABSTRACTS Covering 1961- 1973 Period on

- **Agriculture**
- **Agricultural Economics**
- **Agricultural Engineering**
- **Animal Husbandry**
- **Fisheries**
- **Forestry**
- **Veterinary Science**

Edited by: Dr. Lutfur Rahman



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**Dedicated
To the memory of**

Late Dr. Samsud Doha, former Associate Professor, Department of Aquiculture and Management, and the first Co-ordinator of the Bangladesh Agricultural Sciences Abstracts in **1974**

Acknowledgement

The Bangladesh Agricultural University Old Boys' Association Gratefully Acknowledges the financial grant of the Bangladesh Agricultural University and Bangladesh Agricultural Research Council made against the publication of the **first volume** of the Bangladesh Agricultural Sciences Abstracts (BASA) published in **1974**.

Acknowledgement (Present Edition)

In the present edition the editor recognizes the contribution of the first committee, which completed a pioneering and stupendous job of that time. Also he acknowledges the financial contribution of the *Resource Development Foundation (RDF)*, a Family Trust Fund of Prof. Lutfur Rahman and Prof. Lutfun Hussain for funding the publication of this edition in April **2019**.

Message from the Vice-Chancellor, BAU

It is a great pleasure for me to know that the Bangladesh Agricultural University Old Boys' Association has completed the publication of the first volume of the Bangladesh Agricultural Sciences Abstracts. I am happy that the association members, a young group of professionals are pioneering the development of professional journals and abstracts in Bangladesh. These are very much essential for overall balanced development of Agriculture in the country. The Bangladesh Agricultural Sciences Abstracts, I am sure, will go a long way in establishing a correct way of abstracting the results on regular basis, so that those engaged directly in research and planning can make good use of the results obtained in different fields of Agricultural Research. This will create a better understanding between the scientists of this field.

Though at the initial stage, the association suffered financial stringencies for such a voluminous work but that was well appreciated by the University authority and a grant was made for this purpose. Subsequently, the Bangladesh Agricultural Research Council approved a five year project of the Abstract. This correct approach of the association needs to be appreciated and supported by all those who are engaged in this professional field.

I am confident that the work compiled in this volume, though not complete in all forms but can be considered as a good collection. I shall be happy, when it will continue to grow and will make its way into the community of scientists, teachers, students, workers and planners of agricultural field both inside and outside the country.

Professor Musleh Uddin Ahmad Chowdhury
1974

Message from the President BAUOBA

Bangladesh Agricultural Sciences Abstracts and humble presentation of the Bangladesh Agricultural University Old Boys' is being released from the press with these few words. The initiation as well as the execution of the entire project would not have been so successful without the constant inspiration of our Vice-Chancellor Professor Musleh Uddin Ahmad Chowdhury. To many veteran of the profession, our courage to shoulder the initiation of such a gigantic work without any fund and experience was a dream. But we are happy that the dream of a few has become reality with the kind financial assistance of the Bangladesh Agricultural University as well as the Bangladesh Agricultural Research Council. This attempt of the association, I am sure, will keep its continuity and the abstracting unit will grow by time. I, on behalf of the association and on my own behalf express sincere thanks to all those who have contributed to this work. Co-ordination of the Committee for B.A.S.A. deserves special tanks of the Association. We remain grateful to Professor M.U. Ahmad Chowdhury, Vice Chancellor, Bangladesh Agricultural University and Dr. K.M. Badruddoza, Executive Vice-Chairman, Bangladesh Agricultural Research Council for the direct help and inspiration during the tenure of the entire work.

Lutfur Rahman
President, 1974

Co-ordinator's note on BASA

I like to take this opportunity to say a few words about the Bangladesh Agricultural Sciences Abstracts which is a humble presentation of the Bangladesh Agricultural University Old Boys' Association. The necessity of such a publication was felt long ago by the agricultural experts and scientists of Bangladesh. But this could not be materialized due to the giganticity and volume of works, financial stringency and other accompanied handicaps. The Association has taken a bold step in this regard and sat up a 12 member Committee for Bangladesh Agricultural Sciences Abstracts in December 1973 with late Dr. Shamsud Doha as its first Coordinator. The work of collection and compilation was progressing well since then, but the sad and premature demise of Dr. Doha temporarily halted our work. Afterwards, this heavy responsibility of coordinator ship was bestowed upon me in April, 1974. It would be difficult for me to carry out this task without the active cooperation of all scientists engaged in agricultural research and the sincere determination of all members of the Committee. I like to further add that possibly this work could not be completed without the constant inspiration, valuable suggestions and personal interest of our Vice-Chancellor, Professor M. U. Ahmad Chowdhury.

We have tried to collect and compile the research works done in agricultural field in Bangladesh for the period from 1961 to 1973. We know that this collection is not a complete one and not free from unavoidable mistakes. Therefore, we have kept provision for the left over abstracts in our next volume.

On behalf of the members of the Committee and on my own behalf, I thank all those who directly or indirectly helped us in collecting and compiling the abstracts. Our tiny effort will be fruitful, if this compilation comes to any use to the agricultural scientists, extension workers, teachers, planners, and students alike.

M. Eaquib
Coordinator, Committee for BASA
1974

Editor's note

It is a pride privilege for me to be actively associated with the publication of the Bangladesh Agricultural Sciences Abstracts, the first of its kind in the country. We attempted its publication in the year 1973. Collection was completed by October, 1974. Due to difficulties in good printing condition in Mymensingh our work could not be finished before June 1975. From now this is an annual abstracting unit and we hope that the future volumes will arrive at our readers in time.

All the abstracts collected are divided into different major fields like Agriculture, Agricultural Economics, Agricultural Engineering, Animal Husbandry, Fisheries, Forestry and Veterinary Science. Within each fields, subjects with wider coverage were isolated and set. Again within each broad subject special attention was given to subjects of more specific natures and these were grouped separately. In each such specific field we started with the year and within year the abstracts were arranged according to alphabets of author (s) name. At the end, we tried to place the subject index as well as the author index, where only the abstract numbers were used. In a part of the abstract we tried to give a few abstracts of the journals being published in Bangladesh.

This attempt, I am sure, though not complete and free from some unforeseen mistakes, will bring before you the facts of our researches in this professional field. We will be glad to receive any constructive criticism from our readers, so that in the next issue we can make the abstracts more standard.

On behalf of the Editorial Board and on my own behalf, I express my sincere thanks to all the persons and institutions who have directly or indirectly contributed to the success of the Bangladesh Agricultural Sciences Abstracts.

Lutfur Rahman,
Editor, BASA, **1974**

Editors' note on the present edition of BASA, 2019

The present compilation Bangladesh Agricultural Sciences Abstracts (BASA) volume 1 of 1974 covering the Abstracts published and in use covering the period of 1961 to 1973. This and that of the other volume are also available as two volumes in the Libraries of BAU, BARC and other universities and institutes. During 1974 and 1976 we published two volumes of the book with approval of the BAU and funding by the BARC. The abstracting could not be continued for many different reasons. However, the BAUOBA continued to publish the Bangladesh Journal of Agricultural Sciences established in 1974 with its first volume. In 2018 with financial assistance of the Bangladesh Agricultural University and BAUOBA one compendium of 1530 abstracts of the published papers in the BJAS covering 34 years and 68 issues have been completed. The present one is the second edition of the originally published volume of BASA in 1974. This compilation is expected to serve the scientific information- need of the future scientists planning to work in all the lines covered in the volume.

The present edition covers 1144 abstracts published in the original volume in 1974

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Forestry	05	
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I have completed this compilation work in one CD volume keeping every item of previously printed book. It has been printed as a second edition of BASA. Considering the present day scientists need and the time for review, this has been done with funds from the *Resource Development Foundation (RDF)*.

Prof. Lutfur Rahman
Editor BASA
Present Edition, April, 2019

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Abstracts on Agriculture 1-807

Agr. 1 Karim, M.A. 1967. **A study of the influence of size of farm, land topography and irrigation facilities on the cropping patterns in three different localities of Dacca district.** *M.Sc. Ag. Thesis. East Pakistan Agr. Univ. (MS) 122p.*

A study was made in the three different localities of Dacca for finding out the influence of farm size, land topography and irrigation facilities on the cropping patterns. The data were the average of three years. The distribution of land of different topographies in the localities is highly uneven and cropping intensities in various farm sizes were also different. In the medium land cropping intensity was higher and low land it was lower. In high land aus paddy and jute was widely cultivated and transplant aman in the medium land. In poor drained medium land broad cast aman was also practiced. With irrigation facilities intensive type of farming was followed with a small number of crops. In the three factors combination irrigation along exerts the maximum influence on the cropping pattern, but topography next and farm size may be the least.

Agr. 2 Mansur A.K.M. 1968. **A class study of some progressive farms of Dacca district to ascertain the means and methods by which the owner raised the production levels of transplant aman, aus, potato and sugarcane.** *M.Sc. Ag. Thesis. East Pakistan Agr. Univ. (MS) 116 p.*

Seventeen prize winning farmers, each at aus paddy, transplant aman, potato and sugarcane of Dacca district under the scheme for the Establishment of Rural Demonstration Farms and Plots were studied from 1963-66 to ascertain the methodology they had adopted to raise the production level of these farms. The use of better variety, better cultural practices, timely sowing or planting, judicious and timely manuring and the prevention of insect pest, and diseases were the main factors responsible for high production.

Agr. 3 Islam, H. 1969. **A study on the effect of net sown field crop area and flooding pattern on the cropping pattern in 9 villages of Faridpur-Barishal Flood Control and Irrigation Project.** *M.Sc. Ag. Thesis. East Pakistan Agr. Univ. (MS). 150 p.*

A study was conducted in 9 villages of the Faridpur-Barisal Flood Control and Irrigation Project on the basis of data collected in 1968, covering the years 1965-66, 1966-67 and 1967-68 from 150 farmers through interview method with the help of a specially designed questionnaire to find out the effect of size of net sown field crop area flooding pattern on cropping pattern.

The concentration of farms were in the farm size group 1-2.99 acres (49\0%) gradually decreasing towards two ends of this size group. Percentage of farms together with highest number (36.67%) of farms was found falling under low elevation group, lowest (29.33%) in high elevation whereas 34% of farms had medium elevation. Medium elevation had the highest cropping intensity, high had the highest cropping intensity, high elevation had

medium intensity, lowest intensity was in low elevation area. Single cropping pattern was high in high elevation, low in medium elevation and medium in low elevation. The rate of increase in flood depth was very sharp in high elevation. In medium land flooding was low and of short duration and also the rate of increase of flood depth was less than that of high elevation. The drainage of flood and monsoon rain water accumulated in the area was inadequate and this was indeed the notable finding of the study.

Agr. 4 Sattar, M.A. and A.H.M. Ali 1969. **Comparative studies on the con-tour and plain land cultivation methods in relation to yield and yield components of different varieties of transplant aman paddy at different fertility levels.** *M.Sc. Ag. Thesis. East Pakistan Agr. Univ. (MS).* 107 p.

The work was done with 3 varieties of rice and 2 topography levels to find out the yield and yield contributing characters.

The work showed that the rice cultivation in hill is costly. Among the varieties studied - the local variety (Chanmuni) was food for both the hill and plain land. IR-5 failed to give good results both on hill and plain land. The fertilizers 90-120-60 lbs. N, P₂O₅ and K₂O/acre gave the yield of all the varieties.

Agr. 5 Haque, M.Z. and Mian, A.L. 1967. **A study on the physical characteristics, germinability and depths of planting of agricultural seeds of East Pakistan.** *M.Sc. Ag. Thesis. East Pakistan Agr. Univ. (MS).* 117 p.

A research work, consisting of three experiments was conducted at the Department of Agronomy, Bangladesh Agricultural University, Mymensingh (i) to study the physical characteristics of different crop seeds of Bangladesh, (ii) to determine the germinabilities and duration of germination period of different crop seeds; and (iii) to determine the effect of 11 planting depths. The effect of substrata on the percentage of germination and duration of germination period was variable. Depending upon crops and substrata, the duration of germination period varied from 4 to 15 days. Depths of planting significantly affected the percentage of germination in all crop seeds included in the study. Depending upon crops and depths the duration of germination period ranged from 4--16 days.

Agr. 6 Mian, A.L. and L.C. Coffey. **Testing seed for their viability and vigour.** *Pakistan J. Sci. (1 & 2) : 75-82.*

Seed is the basic material in agricultural production. The quality and volume of harvest depend largely upon the quality of the seed planted. In fact, a crop grower harvests the seed that the plants. "Whatsoever a man soweth, that shall he also reap". Seed health determines the crop health. Hence, testing seed, before planting, is prerequisite for scientific culture of crops.

The two terms,, 'seed viability' and 'seed vigour', are not identical. Seed viability refers to the life of a seed and indicates whether a seed is living or dead. On the other hand, seed vigour refers to the 'strength' of life, or stamina or the living force in a seed. Seed vigour has been conceived and defined by various authors who have used many different tests to determine it.

Agr. 7 Khan, A. N. S. 1966. **An Elementary study on the morphology systematic and crop association of weeds collected from cultivated lands of Agril. University Campus. M.Sc. Ag. Thesis. East Pakistan Agr. Univ. (MS). 98 p.**

1. All weeds collected from the cultivated lands within the university campus. Weeds were collected from the September 1965 to March 1966. Weeds belong exclusively to *Angiosperms*.
2. The dominant harmful weeds mostly belong to the family of *gramineae* and *cyperaceae*.
3. Analytical keys for the families, genera and species are provided.
4. Diagnostic characters, crop association of weeds had been given.

Agr. 8 Mian A.L. and M.A. Rahman. 1969. **Chemical weed control in transplant aman rice. Sci. Res. 6(4): 219-226.**

Five weedicides, namely, Stam F-34, Rogue, Planavin, Prefix and 2, 4-D, were tried for their efficiencies, compared to local hand weeding method, in controlling weeds in transplant aman rice field. Six species of weeds, with *Eclipta prostrata* Hassk. and *Scirpus mucromatus* L. constituting 93% of the total weed vegetation, were found growing in the experimental plots. Results obtained indicated that weeds, when not controlled, reduced the grain yield to the extent of 21.70% in comparison to the hand weeded crop. This reduction in grain yield was due to the production of lesser number of ears per hill coupled with lesser number of grains per ear in the unweeded crop. This indicated that weed control was necessary for producing a normal crop of transplant aman rice. So far the weedicides were concerned, any one of the weedicides used would control weeds as effectively as did the hand weeding method.

Agr. 9 Banik, M. L. 1969. **An elementary study on the morphology, systematic and crop association of weeds of the East Pakistan Agril. University Campus. M.Sc. Ag. Thesis. East Pakistan Agr. Univ. (MS). 108 p.**

A survey of crop weeds of East Pakistan Agril. Univ. Farm was done during the period from April 1967 to March 1968. The weeds were collected at their seedling stage and studied for their morphology, systematic, growth habit, growing season, crop association and intensity of infestation.

82 species of weeds, belong to 30 families were found growing in the area under survey. Of these 82 species 15 are severely infested ones.

Agr. 10 Das, N.L. 1969. **A study on the morphology, systematic and crop association of weeds of the East Pakistan Agril. University Campus. M.Sc. Ag. Thesis. East Pakistan Agr. Univ. (MS). 94 p.**

A survey of weeds was observed to grow in the lands of East Pakistan Agril. University Campus, Mymensingh in the year 1967-68. The work enumerates only 81 species of flowering plants under 27 families and 66 genera, and 3 species of non-flowering plants under 3 families with their brief diagnostic description.

Botany

Agr. 11 Hanna, M.A. 1970. **Somatic Recombination in Common-A heterokaryons of schizophyllum commune. Pakistan J. Bot. 2(2) : 13-20.**

Common-A heterokaryons of *Schizophyllum commune* developed from auxotrophic parents were used for studying somatic recombination and, if possible, isolating vegetative diploid strains. A simple method was devised for this purpose, which comprised the growth of the heterokaryons first in liquid minimal medium, then the fragmentation of the resultant mycelia and sub-sequently the plating of the fragments on medium of agar to select colonies differing from the 'flat' heterokaryon types. The selected colonies were isolated and analyzed both for nutritional requirements and mating type's factors. Genotypes resulting from recombination between two parental nuclei of a heterokaryon could be detected. The probable mechanism of their formation and the usefulness of the technique in selecting them have been discussed.

Agr. 12 Anwar, S. K. and M. A. Ali, 1971. **The sedges of the East Pakistan Agricultural University Campus. M.Sc. Ag. Thesis, Bangladesh Agr. Univ. (MS). 74 p.**

The present investigation comprises a taxonomic study of the sedge flora of the Bangladesh Agricultural University campus. From the area under study representative specimens of sedges have been collected, dried and preserved as herbarium specimens. The sedges collected have been identified, described and their origin and distribution mentioned. Wherever it has been possible, their local names and economic importance have been included.

Artificial keys have been provided for the identification of the genera and species of sedges of the area. Further, suitable illustrations of all the species collected have also been included as an aid to their identification.

Forty one species of sedges belonging to eleven genera have been collected and studied from the area. Eleven species of the genus *Fimbristylis* ; 10 species of *Cyperus* ; 6 species of *Scirpus* ; 4 species of *Eleocharis* and *Pycneus* ; and 1 species of each of *Echinolytrum*, *Fuirena Juncellus*, *Kyllinga*, *Lipocarpa* and *Marisens* were listed.

Agr. 13 Ahmed, M. A. and M. A. Ali, 1972. **Cucurbitaceae of the Bangladesh Agricultural University Campus and its surrounding localities.** *M.Sc. Ag. Thesis, Bangladesh Agr. Univ. (MS)*. 92 p.

A taxonomic study of the wild as well as cultivated species of the *cucurbitaceae* of the Bangladesh Agricultural University campus and its surrounding localities was undertaken. Plant specimens were collected, dried and preserved as herbarium specimens in the Department of Botany. The collected specimens have been identified, described, and their origin and distributions mentioned. Specimens were identified with the help of the available flora and other references. Artificial keys have been prepared for the identification of the cultivated and wild cucurbits of the area under study. The investigation revealed that a total number of 19 species occur in the area. Out of the 19 species 18 belong to 12 genera and the rest one species remains unidentified. Of the 12 genera, *Momordica* and *Trichosanthes* include three species each, *Cucumis* and *Fuffa* each include two species, and the general *Benincasa*, *Citrullus*, *Coccinia*, *Cucurbita*, *Gymnopetalum*, *Lagenaria*, *Mukia* and *Thladiantha* include only one species each. The investigation further revealed that the commonly cultivated edible variety of Kakrol is *Momordica dioica* Spreng and not *Momordica cochin chinensis* Spreng, as is mentioned in local Botany Text books. Similarly, the common sweet gourd of Bangladesh which is generally named as *Cucurbita maxima* Duchesne in the local Botany text books is actually *Cucurbita moschata* Duchesne.

Agr. 14 Islam, A. K. M. N. 1973. **A new species of boodleopsis [chlorophyta] from Bangladesh.** *Bangladesh J. Bot.* 2(1) : 53-67.

Boodleopsis sundarbanensis Islam, a new species of coenocytic green alga (*Siphonales*) has been described from the muddy soil of mangrove forest of Sundarbans, Khulna district and similar habitats of Chittagong district, Bangladesh.

Agr. 15 Islam, A. K. M. N. 1973. **The algal flora of sundarbans mangrove forest, Bangladesh.** *Bangladesh J. Bot.* 2(2) : 11-36.

The benthic algae, excluding euplankton, of the mangrove area of Sundarbans have been studied and divided into three groups, e.g. (1) drifted, detached forms ; attached to (2) littoral muddy soil; and (3) pneumatophores, logs and barks. Twenty genera and 37 species, belonging to *Cyanophyta*, *Chlorophyta*, *Rhodophyta*, *Phaeophyta* and *Chrysophyta* are described and illustrated here. The last two classes are represented by a genus each.

Agr. 16 Khan, M. S. and M. A. Hassan. 1973. **The genus lindernia all. from Bangladesh.** *Bangladesh J. Bot.* 2(1) : 1-17.

The genus *Lindernia* All. is represented in Bangladesh by 13 species under 6 sections. Artificial keys to sections and species are provided. Detailed taxonomic descriptions of all the species are given.

Entomology

Agr. 17 Ahmed, M. and M. Z. Alam. 1971. **Studies of the effect of organophosphorus acaroides, kilval, zolone, malathion and brandol on mites of different crops in Bangladesh.** *M.Sc. Ag. Thesis, Bangladesh Agr. Univ. (MS).* 70 p.

Experiments were conducted to evaluate the efficacy of four different acaroides ; Kilval, Zolone, Malathion and Brandol for the control of different species of mites on brinjal, bean, banana, jute, cowpea and cotton. Mites were exposed to acaroidal sprays for 24 and 48 hours and their relative toxicity were assessed. 9.5 lbs/acre of Kilval was better than the high dosages of Malahion, Brandol, and Zolone in controlling mites of bean, banana, jute and cowpea.

Agr. 18 Alam, M. Z. 1961. **A note on the life history of brown scale *Saissetia cgffeaf* [Walker] [Coccidae ; Hemiptera] on a new host, *Rauwolfia serpentina* Benth.** *Pakistan J. Sci. Res.* 13(2).

The brown scale, *Saistia coffea* (Walker) has been for recent years an important pest of *Rauwolfia serpentina* B., a very important medicinal plant in and around Dacca. From 1957 to 1959 some investigation on its biology was undertaken. The habits and habitat relation and the characteristics of infestation of the pest have been given. The nature of injury and the economic importance have been enumerated. The bionomics of the different stages with their external morphological characters has been described.

Agr. 19 Alam, M. Z. 1962. **Biological notes on the butterflies of Dacca, 1.** *Scientist Pakistan*, 5(1-4).

Studies were conducted from 1949 by to 1961 by collecting the butterflies, found in and around Dacca. The collection consisted of forty different species representing twenty four general and seven families, viz. Nymphalidae Danaidae, Satyridae, Papilionidae, Pieridae, Lycaenidae and Hesperidae.

Each species has been briefly described. Their synonyms and son have been enumerated. Food plants have been recorded. Size of male and female adults has been given.

Agr. 20 Alam, M. Z. 1962. **A. note on a new record of insect virus disease in East Pakistan.** *Pakistan J. Sci. Res.*, 14(1).

During the biological studies of rice ear-cutting caterpillar, *Pseudaletia unipuncta* (Haworth), caterpillar was collected from the field and among these some diseased moribund and dead caterpillars were also there. To know the causal organism of the disease, specimens were sent to Dr. E. A. Steinhaus, Director, Insect Pathology Laboratory, and Berkeley, California. The pathogen was identified as a virus, *Morator nudus* Wasser which was a first record of insect virus in East Pakistan.

Agr. 21 Alam, M. Z. and S. A. Peyara. 1962-63. **Studies on the biology of brown scale, *Saissetia coffeae* [Walker] [Coccidae; Hemiptera] on *Rauwalfia serpentina* Benth in East Pakistan.** *Annu. Rep., Div. Entom. A.R.I.*

The brown scale, *Saissetia coffeae* (Walker) is a very destructive pest of *Rauwalfia serpentina* B., and important medicinal plant grown in East Pakistan. The nature of injury and extent of damage has been enumerated. Different stages of the life history have been described. Seasonal history has been enumerated and natural enemies recorded.

Agr. 22 Alam, M. Z. 1963-64. **Notes on the Rhinoceros beetle, *Oryctes rhinoceros* Linn.** *Annu. Rep., Div. Entom. A.R.I.*

A survey on the habitate of the Rhinoceros beetle, *Oryctes rhinoceros* L. has been conducted in the infested areas in cocoanut orchards. The feeding habits, nature and extent of damage including the habitats of the insect have been indicated. Life history has been briefly described. Methods of control have been suggested.

Agr. 23 Alam, M. Z. 1964. **New insect species recorded.** *Rev. Res., Div. Entomo. A. R. I.*

In course of survey work on insect fauna, insects collected from different crops in the field, were identified but in most of the cases they were sent to the Commonwealth Institute of Entomology, London for their correct identification and confirmation. The work started from 1949 and continued up to 1963 and during the period some unnamed new species were recorded which were not available in the collection of British Museum and stated to be new species. Some of these were being designated their names and described as per rules of the International Zoological Nomenclature and then printed and circulated.

Agr. 24 Alam, M. Z., A. Ahmed and S. Ali. 1964. **Control of winter aphids in East Pakistan.** *Pakistan J. Sci.*

Winter aphids occurring on cotton, mustard and bean are very important pests in East Pakistan. These insects cause serious damage to the crops. A series experiments were conducted during 1962 and 1963 with Dimecron, Malathion, Sayfos and Perfection to control aphids in and around Dacca Farm. The results thus obtained are briefly summarized in tabulated form and discussed there.

Agr. 25 Alam, M. Z. 1964-65. **Aphids of East Pakistan.** *Annu. Rep., Div. Entom. A.R.I.*

During the survey of different crop pests eighteen different species of aphids have so far been recorded in East Pakistan. They are listed below with their host plants, parts affected and the localities from where they were recorded first.

Agr. 26 Alam, M. Z. **Morphology of the male reproductive system of army worm.** *Proc. 17th Pakistan Sci. Conf., Karachi.*

In course of the biological studies of army worm, commonly known as rice-ear-cutting caterpillar, *Pseudaletia unipuncta* (Haworth) the reproductive systems were studied. The

morphology of the female reproductive system was described. This description consisted of mainly Testes, Seminal Vesicles, Vas Deferens, Ductus Ejaculatorius Duplex, Accessory glands, Ductus Ejaculatorius Simplex, Adeagus and Endophallus. Each of these was briefly described.

Agr. 27 Alam, M. Z. 1965. **A new leaf minor and its control in Dacca farm.** *Proc. 17th Pakistan Sci. Conf., Karachi,*

A microlepidoptera, *Cosmopterix* sp. (Cosmopterigidae) had been recorded for the first time to infest country bean leaves during November, 1963 to January 1964 in Dacca Farm.

The life history, habits, seasonal history and morphology of different stages of the pest have been studied. The specific name could not be given as yet even by the Commonwealth Institute of Entomology, London. More specimens, for its correct specific identification, have been sent to Commonwealth Institute of Entomology, London again.

A few control experiments were carried out in Dacca Farm during December 1963 to January. 1964 and again November, 1964 with Dimecron 0.03% Lebaycid and Folithion 0.05% and all these insecticides were proved effective showing mortality of mining caterpillars 93%, 89% and 78% respectively 24 hours after spray.

Agr. 28 Alam, M. Z. 1965-66. **A list of predatory lady beetles so far recorded in East Pakistan.** *Annu. Rep., Div. Entom. Agr.Res.Inst.*

During the period of parasitic studies some observations were made on the larval parasite, *Apanteles ruficrus* (Haliday) of *Mythimna unipuncta* (Haworth). This parasite is abundantly found in the infested field of outbreak of rice ear-cutting caterpillar, *Mythimna unipuncta* (H).

A wide variety of hosts are in records for this cosmopolitan parasite. It is also known to parasite *Plusia chalcites* Esper and *Tortrix* sp. in Newzealand. In Australia it has been recorded from noctuid insect larvae of *Agrotis* sp., *Naranga diffusa* Walker and *Spodoptera mauritia* Boisduval. In Canada and U.S.A. it is a common parasite on different species of armyworm including *M. unipuncta* (H), This parasite is commonly found in Bangladesh on *M. unipuncta* (H.) and *Spodoptera mauritia* Boisduval. White cocoon of the parasite are abundantly found on host larvae during the late period of outbreak.

Agr. 30 Alam, M. Z. 1965-66. **A list of parasites recorded on *Mythimna unipuncta* [Haworth] in East Pakistan.** *Annu. Rep., Div. Entom. Agr.Res.Inst.*

In course of the biological studies on rice ear-cutting caterpillar, *Mythimna unipuncta* (Haworth) the parasites have been recorded on the different stages of the pest species.

Agr. 31 Alam, M. Z. 1965-66. **Trial of carbicron for the control of winter aphids in Dacca.** *Annu. Rep., Div. Entom. Agr.Res.Inst.*

Carbicron, a new systemic organo-phosphorus insecticide recently developed by Ciba Ltd., Basle, Switzerland, was tested against mustard aphid, *Lipaphis pseudobrassicae* (Davis) and bean aphid, *Aphis madicagenis* K. in Savar, Dacca. The insecticide is also known with its code name, C-709 and chemically known as 3 (Dimethoxyphospinyloxy)-N, N-di-methyl-cis-crotonamide.

In December 1965 and January, 1966 a few experiments were conducted near Savar area to find out the effectiveness of Carbicron 0.025 per cent (active ingredient) against mustard and bean aphids.

The plot size was 22' x 33' and the treatments were Carbicron and control each replicated three times. Carbicron 0.025 percent gave an excellent control of mustard and bean aphids with 89.3 per cent reduction of population after 24 hours of the treatment. 100 per cent mortality of the pest was recorded after 48 hours of the treatment.

Agr. 32 Alam, M. Z. 1965-66. **Trial of perfekthion for the control of winter aphids in Dacca Farm.** *Annu. Rep., Div. Entom. Agr.Res.Inst.*

Perfekthion, an organophosphorus systemic insecticide, was tested against mustard aphids, *Lipaphis pseudobrassicae* (Davis) and bean aphids, *Aphis madicagenis* K. in Dacca farm during December, 1965 and January, 1966.

From the results recorded, it has been found that even the lowest concentration of 0.01% of Perfekthion 40 EC (4 oz. per acre) is very effective for the control of aphid with 79% average mortality after 24 hours spray and 94% average mortality (in some cases even 100% mortality) after 48 hours after spray. The higher concentrations of 0.015% and 0.02% gave higher mortality per cent in all the experiments.

The effective dosage of Perfekthion 40 EC has been recommended as 0.01% concentration, i.e. 4 oz. per acre.

Agr. 33 Alam, M. Z. 1966. Use of microorganisms for the control of insect pest in East Pakistan. *Proc. Agr. Symp. A.E.C., Dacca.*

Like human beings, insects are also susceptible to a variety of infectious microorganisms. viz., bacteria, fungi, viruses, protozoa and nematodes. These organisms cause pathogenic diseases among insects as they cause in human beings and other animals. The author enumerates a history of the idea involved, and pathogenicity of the species of microorganisms among insect pests. A few species of pathogenic microorganisms were recorded in East Pakistan. Two bacterial species, *Bacillus thuringiensis* Berliner, *Bacillus popilliae* Dutky and one fungus species, green muscardine, *Metarrhizium anisopliae* (Metch.) have been tested for the control of insect pests in East Pakistan. Among the bacterial species, *Bacillus*

thuringiensis Berliner has been tested in the laboratory as well as in the field for the control of larvae of rice swarming and rice ear-cutting caterpillars. The other bacterial species, *Bacillus popilliae* Dutky has been tested under laboratory conditions against some Lepidopterous are awaiting further field trials. The fungus, green muscardine has been found promising for the control of rice hispa, Laboratory trials are in progress.

Agr. 34 Alam, M. Z. 1966. **Lac culture in East Pakistan.** *Illustrated weekly Pakistan Karachi.*

A brief history about lac cultivation in Indo-Pakistan in general has been given. Descriptions about the lac insect and its biological aspects have been indicated. The lac crop grown in different places of East Pakistan and their intensity have been given. Performances of the insect of different hosts have been stated. Different uses and the by-products of lac have been enumerated. The causes of hindrance in growing lac in East Pakistan have been stated. Present position of lac culture has also been given.

Agr. 35 Alam, M. Z. 1966-67. **A list of mealy bugs recorded in East Pakistan.** *Annu. Rep., Div. Entom. Agr.Res.Inst.*

In course of insect pest survey study 12 species of mealy bugs (Coccidae; Hemiptera) have so far been recorded.

Agr. 36 Alam, M. Z. 1967. **Recommendations for insect pests control in East Pakistan.** *Proc. Seminar on Insect Pest Control, A.E.C., Lahore.*

Recommendations for insect pest control have been suggested for East Pakistan. Restrictions regarding the use of chemical insecticide have been suggested. Insecticides having fish toxicity would not be recommended for East Pakistan. Suggestions have been made for avoiding contamination and population.

Agr. 37 Alam, M. Z., I. I. Azim and M. Abbas. 1968. **Fish toxicity tests of thirteen insecticides.** *Proc. 20th Pakistan Sci. Conf., Dacca.*

A series of laboratory tests were performed to ascertain the lethal dosages of thirteen different insecticides to Shinghi fish. *Heteropneustes fossilis* Block (Heteropneustidae, Siluroidei), The technique involved was placing ten fish of medium size in each glass aquarium containing 8.8 gallons (40000 cc) of fresh tap water. Each insecticide was with three replications and one set was kept control. The doses were gradually decreased or increased to obtain 50% fish killed in 24 hours after treatment. Observational data were recorded at several intervals, such as, one hour, three hours, six hours, twelve hours, twenty four hours, and forty-eight hours after adding the insecticides into the water of aquaria in treated sets.

Agr. 38 Alam, M. Z. 1968. **Studies on the morphology of the reproductive system of female adult of *Pseudaletia unipuncta* [Haworth].** *Proc. 20th Pakistan Sci. Conf., Dacca.*

The reproductive system of the female adult *Pseudaletia unipuncta* (Haworth) was studied and described. The description consisted mainly-Bursa Copulatrix, Seminal Ducts. Spermatheca, Accessory Glands, Ovaries and Ovipositor. Each of these was briefly described.

Agr. 39 Alam, M. Z. 1968. **Evaluation of Thiodan as an insecticide.** *Proc. 20th Pakistan Sci. Conf., Dacca.*

Field tests were conducted to determine the effectiveness of Thiodan (Endosulfan), on foliage infesting insects like Rice hispa, Jute semilooper, Mustard, Bean, Cotton and Brinjal aphids and boring insects like rice borers and brinjal shoot borer. Results of these trials demonstrated that these insecticides when applied at the rate of 0.525 pounds active material per acre gave an excellent control of rice hispa, *Hispa armigera* Oliv. and jute semilooper, *Anomis sabulifera* (G.). All the aphids were very effectively controlled with a very little dosage of 0.175 pounds active material per acre. The rice borers, *Tryporyza incertulas* (W.) and *Chilo traea auricilla* D. and brinjal shoot borer, *Leucinode orbonalis* G. were effectively controlled when 0.7875 pounds active material per acre was used. Thiodan has now been emerged as an excellent insecticide for pests of East Pakistan.

Agr. 40 Alam, M. Z. 1968. **Insecticides for the control of *Aphis gossypii* G. in Dacca Farm.** *Proc. 20th Pakistan Sci. Conf.*

The population of cotton aphid, *Aphis gossypii* G, was very abundant during December, 1966. Experiments were conducted on cotton at the Agricultural Experiment station, Dacca to determine the effective optimum dosages of different insecticides, viz., Dimecron, Carbicron, Diazinon, Perfekthion, Thiodan, Sayfos, Supracide and Metasystox. These insecticides when applied at the rate 0.1875, 0.1875, 0.225, 0.1, 0.175, 0.175, 0.2 and 0.15 pounds active material per acre respectively gave almost 100% mortality 72 hours after spray. Diazinon, Perfekthion, Thiodan and Sayfos showed better effect than other four after 24 hours spray.

Agr. 41 Alam, M. Z. 1968. **A general review of the stored grains pests in East Pakistan.** *Proc. Seminar on Stored Food and Food Technology, A.E.C., Dacca.*

A list of the 24 different stored grains pests has been given. The nature and extent of damage and the annual loss caused by them have been indicated. The different methods of storing have been discussed. Control measures based on the experimental trials have been suggested.

Agr 42 Alam, M. Z. and S.K. Ahmed. 1970. **Studies on the susceptibility of different lepidopterous larvae to microbial insecticide, *Bacillus thuringiensis* Berliner in East Pakistan.** *Proc. 21st & 22nd Pakistan Sci. Conf., Rajshahi.*

Green house experiments were conducted in the year 1966 to study the comparative toxic effect of seven different concentrations of imported laboratory produced spores of *Bacillus thuringiensis* Berliner on different instars of rice ear-cutting caterpillar, *Pseudaletia unipuncta*

(H.) and rice swarming caterpillar, *Spodoptera mauritia* Boisdl; cut-worm, *Agrotis ypsilon* Rolt. and prodenia caterpillar, *Prodenia litura* F. Concentrations used was 0.25, 0.50, 0.75, 1.00, 1.25 and 1.50 pounds spore material each per 100 gallons of water including control.

It was concluded that the larvae of prodenia caterpillar appeared most susceptible to the bacterial spores, *B. thuringiensis* B. followed by rice ear-cutting and swarming caterpillars but cutworm larvae showed least susceptible during a test period of 72 hours.

Resistance of the cutworm larvae to bacterial infection increased directly with the age of the larvae. There was no mortality in control group.

Agr. 43 Alam, M. Z. 1970. **Site of action of *Bacillus thuringiensis* Berliner on Lepidopterous larvae in East Pakistan.** *Proc. 21st & 22nd Pakistan Sci. Conf., Rajshahi.*

Histopathological investigations were made to study the site of action of *Bacillus thuringiensis* Berliner spores in third instar larvae of rice ear-cutting caterpillar, *Pseudaletia unipuncta* (H.); rice swarming caterpillar, *Spodoptera mauritia* Boisdl.; cutworm, *Agrotis ypsilin* Rolt. and prodenia caterpillar, *Prodenia litura* F.

Histopathologically, five hours following the infestation of the leaves treated with *B. thuringiensis* spores larvae generally showed a gross disintegration of the mid-gut epithelium, Microscopic examinations of the stained longitudinal sections of infected larvae revealed that prodenia caterpillar was severally affect by the toxin produced by the bacterial spores. The portion of the mid-gut epithelium became disorganized and epithelial cells were detached from the wall of the cutworm larvae did not exhibit such changes.

Some of the epithelial cells in rice ear-cutting caterpillars were disintegrated. Observations indicated that the site of action of *B. thuringiensis* was in the mid-gut of the larvae and it appeared to be sensitive.

Agr. 44 Alam, M. Z. 1970. **Control of insect pests in East Pakistan.** *East Pakistan Agr. Inst. Mag.*

The normal practices of insect control generally used in the present decade have been briefly described. Different groups of insecticides that are in use have been indicated. Use of foliar and granular insecticides and their recommendations have been enumerated.

Agr. 45 Rahman, M. 1970. **Effect of parasitism on food consumption of *Pieris rapae* Larvae.** *J. Econ. Entomol.* 63(3) : 820-821.

It was observed that normal larvae of cabbage white butterfly, *Pieris rapae* (L) (Known in the United State as the imported cabbage worm) consumed more food than those parasitized by the solitary braconid parasite *Apanteles rabecula* Marsh., but less than those parasitized by the gregarious parasite; *A. glemeratus* (L.).

Agr. 46 Rahman, M. 1970. *Exorista flaviceps*, a tachinid parasite of *Pieris rapae* in South Australia. *J. Econ. Entomol.* 63(3) : 836-841.

A tachinid, *Exorista flaviceps* Macquart, has been found effective in controlling the cabbage white butterfly *Pieris rapae* (L.) (Known in the United States as the imported cabbage worm) in the South western region of South Australia. Although the female parasite lays many eggs on 1 larva, the larva contains only 1 parasite larva. This feature seems to be one of the factors determining the population abundance of this parasite.

Agr. 47 Alam, M. Z., A. Ahmed, S.A. Choudhury and M.A. Manna. 1970-71. A comparative study of twenty two granular insecticides at Joydebpur Farm. *Annu. Rep., Div. Entom. Agr.Res.Inst.*

A comparative study to test the effectiveness of twenty two granular insecticides, viz., Azodrin, Bayrosil, Disyston, Diazinon, Difonate, Ekalux, Gardona, Imidan, Lannate, Lebaycid, Niran, Neosar, Nuvacron, Phosvel, Sapercron, Soligam, Sevidol, Terracur P, Paddigard, Thiodan and Unden at the rate of 1.75 lbs. active material per acre was conducted on IRRI aman at the Central Agricultural Research Station, Joydebpur. The first application was done 30 days after transplantation and the subsequent two treatments were given at an interval of 22 days. The results were recorded and analyzed after harvest. The treated plots shown minimum infestation ranging from 2 to 3.75 per cent whereas control plot exhibited 7.98 per cent infestation- As regards increase in yield Paddigard, Diazinon, Axodrin, Phosvel, Ekalux, Sevidol, Disyston, Solvigam, Unden, and Bayrosil achieved better results. Others showed inferior results.

Agr. 48 Alam, M.Z., A. Hamed, S. A. Choudhury and M. A. Mannan, 1970-71. **Field trial with seventeen foliar insecticides at Joydebpur Farm.** *Annu. Rep., Div. Entom. Agr.Res.Inst.*

A field trial was conducted with seventeen foliar insecticides viz., Azodrin, Bayrosil, Cidial, Diazinon, Ethion, Furadan, Gardona + Malathion, Gusathion, H-2960 Nuvacron, 6905, Phosvel, Padan, Thiodan, Unden and Zolone at the rate of 12 oz. active material per acre on IR-8 grown as aman at the Central Agricultural Research Station, Joydebpur. The first application was applied 30 days after transplantation. The subsequent three treatments were given at an interval of 15 days. After harvest the results were recorded and analyzed. The treated plots showed a minimum infestation ranging from 2 to 3 per cent. Diazinon proved best regarding increase in yield. Next promising results were achieved by Phosvel, Azodrin, Nuvacron Bayrosil, Padan, Unden, Thiodan and Gusathion. Others showed inferior results.

Agr. 49 Alam, M. Z., M. S. Alam, M. Abbas and M. A. Mannan. 1971. **Notes on mites so far recorded from brinjal, beans, banana, jute, cotton, and cowpea in East Pakistan.** *Proc. 23rd Pakistan Sci. Conf., Peshawar.*

Mite is one of the most important pests attacking different types of crops in East Pakistan. The adult as well as the nymph attack the young leaves, shoots, flower buds and sometime young fruits as a result of which the leaves curl down, dry up, fall down, shoots dry and ultimately plants remain stunted in growth resulting in less yield of the crops.

Agr. 50 Alam, M. Z. and M. A. Mannan. 1971. **Studies on the effect of organo-phosphorus acaricides, kilval, zolone, malathion and brandol on mites of different crops in East Pakistan.** *Proc. 23rd Pakistan Sci. Conf., Peshawar.*

Mite is one of the most important pests attacking different types of crops in East Pakistan. The experiments were conducted with four different acaricides, Kilval, Zolone, Malathion and Brandol to control the mite pests of brinjal, bean, banana, jute, cotton and cowpea with their four different dosages viz., 0.25, 0.5, 0.75 and 1 lb. active material per acre each replicated three times in sub-plots each with 1/120th acre.

It is indicated from the results that there exists a good relation between the mortality of mites and the concentration of acaricides as well as the time intervals between applications.

Agr. 51 Bhuiyan, N. 1971. **The oviposition behaviour of adult weevil, *Callosobruchus chinensis* L. (Bruchidae : Coleoptera).** *Proc. 23rd Pakistan Sci. Conf. P. 47 p.*

The adult weevil of the family Bruchidae glued her eggs individually on the surface of the small bean, *Phaseolus mungo* L. in an apparently random manner. The female adult deposited 1, 2 or more eggs on bean. This habit of egg-laying developed shortly after emergence and about 30 to 40 per cent of eggs were deposited during the first week of emergence. Eggs were often deposited in clumps in a limited supply of 10 grams of beans (about 360 to 380 beans). The interaction among the individuals in crowds stimulated more oviposition in such situation and it reduced the mean number of eggs per female. The larval mortality became high when more than 2 eggs were laid in a bean. Eggs hatched in low moisture content of the beans and usually one larva per bean was able to develop into adult depending on the size of the bean and adult. Relatively dry beans were more adapted for more than 2 eggs per bean. The frequency of egg-laying decreased as the female became old.

About 50 to 70 per cent of adults emerged when eggs were laid singly in a bean and 20 to 30 per cent of adults emerged from beans with more than one egg per bean. The habit of egg-laying in groups of more than 2 eggs per bean was considered as an adaptation to life in beans of low moisture content in storage.

Agr. 52 Bhuiyan, N. I. 1971. **Biomathematics and control of insect populations.** *Nucleus*. 8(1-2) : 42-55.

Food needs are universal and there is need to increase the total efficiency of food production; therefore, the welfare of mankind will depend upon the rapid utilization of all the proven methods of pest control. Here the author has reviewed some mathematical models of insect population dynamics and their applications to the use of pest control practices today. Biomathematical approach provides better methodology in work with living insects or organisms in the presence of fluctuating physical and biotic factors which exercise action on their population.

Agr. 53 Ferdous, S. Z., and N. I. Bhuiyan, 1972. **Studies on the mass-rearing of noctuid insect pests.** *M.Sc. Ag. Thesis, Bangladesh Agr. Univ. Mymensingh (MS)*. 38 p.

An attempt was made for rearing noctuid insect pest, *Spodoptera litura* F. on artificial diets under laboratory condition. The diet contained agar fibre, casein, sucrose, glucose, cellulose, cholesterol, choline chloride, dried groundnut leaf powder, Wessen's salt, B-vitamins and ascorbic acid. Number of viable eggs laid by the females on this composition was almost same to those reared on natural food plants. Among the composition of the diet, inadequate amount of Wessen's B-vitamins (Thiamine, Riboflavin, Nicotinic acid, Pyridoxine hydrochloride, Ca-pantothenate, Folic acid, and B₁₂) increased the larval mortality and 100 per cent of the larvae died before completing the final instar. Lack of sucrose and host plant substances retarded the larval growth and the body length and weight were affected. Cholesterol in the composition of the diet favoured the growth and reproduction of the species.

Agr. 54 Ahmed, R. U. and M. Ahmad. 1973. **External morphology of the adult and immature stages of the sun-hemp moth, *Utetheisa polchella* L. [Lepidoptera : Arctiidae],** *M.Sc. Ag. Thesis, Bangladesh Agr. Univ. (MS)*. 73 p.

The external morphology of the adult, egg, larva and pupa of *Utetheisa pulchella* L., a major pest of sun-hemp in Bangladesh, was described and illustrated in detail.

The adult moth has conspicuous red and black spots on the forewings. The antennae are filamentous. The head capsule is a relatively simple structure with mouthparts represented by a suctorial proboscis. Labial palpi are highly developed. The prothorax is greatly reduced and is the smallest of the thoracic segments. Sexual dimorphism is prominent in this species. The genitalia of the male and female are composed of the eighth, ninth and tenth abdominal segments.

The egg is light yellow in colour and averages 0.56 mm in diameter. Of the three larval instars, the third one was selected for detailed study. The larval head is hypognathous and the body is moderately covered with hairs arising from chalaza. Adfrontal areas are distinct. The prothorax bears a pair of large spiracles. Each of the abdominal prolegs bears heteroideous

mesoseries crochets. The first eight abdominal segments bear spiracles. The pupa is of the obtect type. Sex differences in the pupae were discussed.

Agr. 55 Begum and J. Begum. 1973. **Relative toxicity of some insecticides to the fourth instars larvae of *Aedes aegypti* [L.], [Diptera, Culicidae].** *Dac. Univ. Stud. (B) : 1-7.*

Eight insecticides were screened out in the laboratory at 82 + 2⁰F of *Aedes aegypti* (L.) of the chlorinated hydrocarbon insecticides DDT was the most toxic to the larvae followed by Aldrin, Dieldrin, Gammexine and Heptachlor. Of the organic phosphorus insecticides, Abate was very toxic to the larvae in comparison to Imidan and Dipterex. The comparative effectiveness of the eight insecticides to the larvae was found as follows : Abate 12 times as toxic as DDT, 15 times that of Aldrin, 23 times that of Dieldrin, 33 times that of Imidan and Heptachlor, and 93 times that of Dipterex.

Agr. 56 Haider, R. and M. Ahmed. 1973. **A study of the internal anatomy of the red pumpkin beetle, *Aulacophora foveicollis* [Lucas] [Coleoptera: Chrysomelidae].** *M.Sc. Ag. Thesis, Bangladesh Agr. Univ. (MS). 58 p.*

Internal anatomy of *Aulacophora foveicollis* (Lucas) was described and illustrated.

The alimentary canal is a convoluted tube, about twice the length of the body, and varies greatly in diameter in its different regions. The midgut is the longest portion of the alimentary canal. Excretory organs consist of six Malpighian tubules which arise in two unequal groups from the right side of the gut and ultimately reassociate with the anterior part of the colon.

The heart has seven chambers clearly defined by six pairs of ostia. The aorta terminates behind the brain. In the respiratory system there are two pairs of thoracic and seven pairs of abdominal spiracles. The former are situated on the meso-and metathorax, and the latter, on the first seven abdominal segments.

The male reproductive system is characterized by a compound, pear-shaped testis. Separate testicular follicles are not distinguishable. The female reproductive system has the usual structure. Each ovary consists of 30 to 34 ovarioles of the acrotrophic type.

The ventral nerve cord consists of three thoracic and three abdominal ganglia. The last abdominal ganglion is a composite one.

Agr. 57 Islam, N. and M. Ahmad. 1973. **Study of the internal anatomy of the adult *Epilachna 12-punctata* Mulsant [Coleoptera: Coccinellidae].** *M.Sc. Ag. Thesis, Bangladesh Agr. Univ. (MS). 62 p.*

Internal anatomy of *Epilachna 12-punctata* Muls. was described and illustrated.

The alimentary canal is about three times the length of the body. The midgut is long and lies in coils and loops. Six long Malpighian tubules, after arising at the junction of the midgut and

hindgut, lie in numerous loops and convolutions. They finally invest the hinder portion of the ileum and colon.

The heart is provided with five pairs of ostia. Segmental chambers were not apparent. The aorta terminates by two fine cephalic arteries. The tracheal system consists of two lateral elongated trunks running parallel to one another, and their branches. There are one pair of thoracic and seven pairs of abdominal spiracles.

The testes are disc-shaped, each being made up of 64 to 66 follicles. There are three pairs of accessory glands. In the female, each ovary consists of 31 to 33 ovarioles of the acrotrophic type.

In the nervous system, extensive fusion of ganglia has taken place in the abdomen. Only two abdominal ganglia are visible. Of these, the second one is very large and may represent a fused condition of the fourth to the eighth abdominal ganglia.

Agr. 58 Shahjahan, M. and Streams, F.A. 1973. **Plant effects on host-finding by *Leiophron pseudopallipes* [Hymenoptera, Braconidae], a Parasitoid of the tarnished plant Bug.** *Environ. Entomol.* 2 : 921-925.

The host-finding activity of *Leiophron pseudopallipes* Loan centers on flowering *Erigeron* plants. Several plant-related variables that could affect host-hinding success were studied. These included Plant height, plant density, host density per plant, the presence of unattractive plants in the habitat, and the background colour of *Lygus lineolaris* (Palisot de Beauvois) feeding sites on the plants. Although the highest percentage of *Lygus* nymphs parasitized was associated with the same plant-height is probably unimportant in the host-finding behaviour of *L. pseudopallipes*. Plant height is influenced by plant density, and evidence suggests that *L. pseudopallipes* is differentially attracted to areas of the habitat with the greatest density of *Erigeron* plants. *Lygus* densities are also higher where the *Erigeron* densities are greatest, which sometimes gives rise to a correlation between parasitization and *Lygus* density.

The presence of other herbs in *Erigeron* patches appears to lower the attractiveness of these stands to *L. pseudopallipes*. It is suggested that these plants may disrupt the olfactory cues used in host-finding. The contrasting background color of the *Erigeron* plants also influenced parasitization. Reddish *L. lineolaris* nymphs, who tend to contrast with green plant background, were 3 times as apt to be parasitized as the green nymphs.

Agr. 59 Peyara, S.A. 1962. **Parasites and predators associated with the brown scale *Saissetia coffeae* [Walker] in *Rauwolfia serpentina* field in Dacca.** *M. Ag. Thesis, Part II-Dac. Univ. (MS)* 58-65 p.

The Brown, Scale, *Saissetia coffeae* (Walker) falls a victim to the grip of outrageous parasite and predators. Two hymenopterous parasites, *Microterys saissetia* and *Anvsia rauwolfia* Alam. were recorded. Some dipterous parasites were also recorded. Among predators two

lady bird beetles, *Ceratomegilla vittigera* (Mann.) and the covergent lady bird beetle similar to *Happodamia covergent* Guerin could be recorded in East Pakistan.

Agr. 60 Peyara, S.A. 1962. **On the life history of the brown scale, *Saissetia coffeae* [Walker] on *Rauwolfia serpentina* in East Pakistan.** *M. Ag. Thesis Part I Dac. Univ.* 54p.

The female Brown Scale, *Saissetia coffeae* (Walker) had to ecdysis and three instars of development. The following seven stages of development were generally distinguished; the egg, the first instars the crawler, the settled stage of first instar nymph, the second and third instar adult, the preoviposition, the oviposition and the postoviposition stages. The male brown scale insect had six stages of development and those stages were the incubation period, the crawling period of crawlers, the settled state of the first instar and the second instar, the pupal period and adult period.

The life cycle of the female was completed on an average in 155 days and that of the male on an average in 65 days.

Agr. 61 Rahman, M. 1965. **Observations of the biology of *Exorista flaviceps*, MacQ., A parasite of *Pieris rapae* L. in South Australia.** *Proc. ANZAAS 38th Congress, Hobart*, 1 p.

A tachinid fortnightly, *Exorista flaviceps* Macq., is a parasite of the larvae of *P. rapae* L. in South Australia. This tachinid was first reported from Australia in 1847, but this is first time that it has been recorded as a parasite. Some observations are given on its life cycle and egg laying behaviour. Host selection by the parasite and host's reaction to it have been shown to be important factors in exercising control of *P. rapae* in South Australia.

Agr. 62 Hossain, M., M. M. Hossain and R. Rahman. 1966. **Laboratory rearing and susceptibility of the confused flour beetle (Adult) to gamma radiation.** *Food Irradiation, France*. 58 : 52-57.

During a study of the susceptibility of the confused flour beetle, *Tribolium confusum*. J. duv (adult) to gamma radiation, a mass rearing of the species was maintained and at the same time its life history was studied. The rearing experiment was maintained on the food source of milled flour at $28 \pm 2^{\circ}\text{C}$ and 5% R.H. The duration of each of the stages in the life cycle was noted and the dispersion in the growth rate was found to be maximum in the embryonic stage and minimum in the larval stage. Adults of the same age were then exposed to different doses up to 25 Kr. to find out the mortality of the population. It was found 100% kill is possible within thirteen days after exposure to 16 Kr. to 25 Kr.

Agr. 63 Maniruzzaman, F.M. and M. Z. Alam, 1966. **On the biology of khapra beetle, *Trogoderma granarium* Everts in East Pakistan.** *M.Sc. Ag. Thesis, East Pakistan Agr. Univ. (MS)*. 100 p.

The khapra beetle, *Trogoderma granarium* Everts (Demestidae, Coleoptera), a major pest of stored wheat and husked rice caused damage to grains by its 4th instar larva. June to October

was found to be peak period of the pest. Infestation of the pest appeared in between 80⁰F and 105⁰F. Temperature from 80⁰F to 95⁰F was most favourable for considerable breeding and multiplication of the pest. Cold and high percentage of humidity lengthened the life cycle whereas temperature shortened the life cycle. The most outstanding feature of the larvae did not feed but molted at long intervals.

Agr. 64 Rahman, M. 1966. **Observations on the biology of *Exorista flaviceps* Macquant, a parasite of *Pieris rapae* L., in South Australia.** *Proc. Agr. Symp. A.E.C.*, 125-129.

A tachinid, *Exorista flaviceps* Macq., was recorded as a parasite on the cabbage white butterfly, *Pieris rapae* L. in South Australia. The paper discusses its biology and conditions that limit its distribution and abundance. The effectiveness of this parasite to control *Pieris rapae* has been discussed. *Exorista flaviceps* has been observed to act as a biological control factor in certain localities.

Agr. 65 Hossain, M.D. and A.K.M.F., Kabir. 1967. **Insecticidal tests on sub-terranean termites in East Pakistan.** *M.Sc. Ag. Thesis, East Pakistan Agr. Univ. (MS)*. 69 p.

Five insecticides (Aldrin, Dieldrin, Chlordane, Heptachlor, and DDT) were tested against worker caste and subsidiary queen of *Odontotermes obesur* (Wasm) and *Microtermes obesi* Hlmg. and their LD₈₀ and LD₉₀ values at 25⁰C were determined.

Termite activities were found in the treated mounds up to 5 days following the treatment. There was no swarming of adults from the treated mounds. Termites were found to be completely killed after three months of treatment. After 49 days, 45% of gunny bag was attacked by termite when untreated gunny bag piece were placed on the treated gunny bag pieces and were placed on the untreated bricks. The entire piece of untreated gunny bag over untreated brick was destroyed by termites.

Agr. 66 Ahmed, S. K. and M. Z. Alam. 1968. **Studies on the susceptibility of different lepidopterous insect pests to microbial insecticide, *Bacillus thuringiensis* Berliner in East Pakistan.** *M.Sc. Ag. Thesis, East Pakistan Agr. Univ. (MS)*. 98 p.

Except cutworm all insects especially their different instars could be controlled to the extent of 60 per cent by *B. thuringiensis* spore. In general younger larvae responded better than the older ones.

Agr. 67 Rahman, M. 1968. **Oviposition by *Pieris rapae* L. in the insectary.** *Pakistan J. Sci.* 20(5-6) : 278-280.

An experiment was conducted in the insectary to determine the number of eggs laid by the females of *Pieris rapae* L., the cabbage white butterfly. It was observed that the females lived up to two weeks. The mating took place generally on the second day after emergence. Egg laying started on the third day after mating. Usually eggs were laid over a period of three to nine days. The maximum number of eggs laid was 498 but the average was 291.5.

Agr. 68 Shajhan, M. 1968. **Effect of diet on the longevity and fecundity of the adults of the tachinid parasite, *Trichopoda pennipes pilipes*.** *J. Econ. Entomol.* 61 : 1102-1103.

Several adult diets, sugar (in the form of cubes), protein hydrolysate with honey, honey and raisin were fed to tachinid parasite, *Trichopoda pennipes pilipes*, in the laboratory. The percentage increase in fecundity and life span of the raisin-fed parasite was 338.72 and 326.3 respectively over control.

Agr. 69 Shahjahan, M. 1968. **Superparasitization of the southern green stink bug by the tachinid parasite, *Trichopoda pennipes pilipes* and its effect on the host and parasite survival.** *J. Econ. Entomol.* 61 : 1088-1091.

Effect of superparasitization on the southern green stink bug, *Nezara viridula* (L.) and its parasite, *Trichopoda pennipes pilipes* (F.) is discussed. The parasite emerged from 30% to 78% of the superparasitized hosts. This percentage was correlated with the number of parasite larval penetrations into each host. At low larval density (2-5 parasite larvae per host), the percentage of hosts from which the parasites emerged was greater (64-78%) than at high parasite larval density (7-14 parasite larvae per host). In the latter case the percentage of hosts which produced adult parasites was reduced to 38%. The fecundity of the superparasitized hosts was reduced to about 59% of the unparasitized hosts, but the percentage of eggs fertility remained unaffected.

Agr. 70 Streams, F. A., Shahjahan, M. and H. G. LeMasurier, 1968. **Influence of plants on the parasitization of the tarnished plant bug by *Leiophron pallipes*.** *J. Econ. Entomol.* 61 : 996-999.

Tarnished plant bugs, *Lygus lineolaris* (Palisot de Beauvois), were collected in the vicinity of Storrs, Conn., and the parasitoids were reared from them. *Leiophron pallipes* Curtis was the principal hymenopterous parasitoid obtained. A few *Euphoriana uniformis* Gahan were reared from tarnished plant bugs from a field near East Hartford, Conn., but were not obtained from bugs collected around Stores.

Tarnished plant bug nymphs were collected from plants of several taxa and were dissected to determine parasitization. Nymphs found on *Erigeron* spp. were much more heavily parasitized than nymphs collected on other plants. The highest parasitization in July occurred on *E. strigosus* Muhl. and *E. annuus* (L.), ranging from more than 30% to nearly 60% in different fields during this period. The highest parasitization during August was on *E. canadensis* L., where more than 30% of the nymphs were parasitized. the highest parasitization on other plants during July and August was 11% on *Verbena* spp. Parasitization of nymphs collected on *Caucus carota* L., *Solidago* spp., *Polygonium pennsylvanicum* L., *Medicago sativa* L., *Trifolium pratense* L., *Chenopodium album* L., *Oenothera biennis* L., and *Amaranthus retroflexus* L., was negligible or nonexistent during both months.

Agr. 71 Rahman, M. 1969. **Fluctuation in oviposition by *Pieris rapae* in nature.** *Pakistan J. Zool.*, 1(2) : 129-133.

A study was undertaken to determine the fluctuation in egg laying in nature by the cabbage white butterfly, *Pieris rapae* L. at different times of the season and the factors responsible for such fluctuation. It was observed by the calculation of partial regression that for egg laying of this butterfly the three conditions, i.e. high temperature, long hours of sunshine and moderate relative humidity are all equally important. No single condition alone is responsible for the number of eggs laid and these three conditions are to some extent correlated.

Agr. 72 Rahman, M. 1969. **The effect of temperature and humidity in growth and mortality in the larvae of *Pieris rapae* L.** *Pakistan J. Zool.* 1(1) : 41-44.

It has been observed that the larvae of *Pieris rapae* L. die in nature in large number when temperature is low, round about 15°C but they do not die in that properties when the temperature rises to about 25°C. The humidity does not play a big role in causing mortality among the larvae.

The larvae that are reared at lower temperatures are all heavier than those reared at higher temperatures. Here again, the humidity has little influence on the weight of the larvae, if they are reared at the same temperature.

Agr. 73 Rahman, M. 1969. **Effect of different food on the Development of *Pieris rapae* L. larvae.** *Pakistan J. Zool.* 1(1) : 35-40.

Experiments were carried out at the Waite Agricultural Research Institute, Adelaide University, to find out the effect of different types of Cruciferous foods and on the larvae of *Pieris rapae* L. It was found that the larvae grown on cabbage leaves took a significantly longer period to become fully mature, but the weight of the resultant pupae did not differ significantly.

Agr. 74 Ahmed, G. and M. Ahmad. 1970. **Some morphological studies on the adult and immature stages of *Diacrisia obliqua* Walker [Lepidoptera : Arctiidae].** *M.Sc. Ag. Thesis, East Pakistan Agr. Univ. (MS).* 83 p..

External morphology of the adult, egg, larva, and pupa of *Diacrisia obliqua* Walker, one of the major pests of jute in East Pakistan was described and illustrated.

The adult body is thickly covered with overlapping scales of various sizes prominent and the two sexes can be separated by the character of antennae, legs, and wings.

Of the six larval instars, the last one was studied in detail. The larval body is densely covered with hairs. Larval chaetotaxy was discussed. Head-width of different larval instars was measured to illustrate Dyar's Law. The pupa is obtect. Sex differences in the pupae were also shown.

Agr. 75 Bhuiyan, N.I. 1970. **Estimation of population parameters of *Epilachna 12-punctata* Muls from data obtained by means of capture-recapture method.** *Res. Report Evaluation & Coordination Comm. Directorate Agr. Govt. East Pakistan 2p.*

Estimation of population size, rate of survival and dilution rates of adult beetles in brinjal fields were made during the months of October to December, 1965. This insect attacked various vegetable crops and both larvae and adults fed on the leaves of host plants.

Capture-Recapture method gave unbiased estimate of total numbers even when death and birth occurred. The estimation of survival rate was made by using Leslie's three point sampling (1952). It was found that the marked beetles mixed with the unmarked population without any biased estimate. The death-rate of adults was very low until the 2nd week of November and then it increased rapidly. Adults of the 2nd generation died completely in brinjal field and those of the 3rd generation migrated to the alternate host plants after the 2nd week of December. It was also found that their movement within the brinjal field was limited to a small distance.

Agr. 76 Dutta, K. R. and N. I. Bhuiyan. 1970. **Development and host-plant preference of *Epilachna 12-punctata* Muls. (Coccinellidae : Coleoptera).** *Res. Report Evaluation and Coordination Comm. Directorate Agr. Govt. East Pakistan.*

The beetle was reared on several species of Cucurbitaceous, Solanaceous and Leguminous plants. The beetle was highly adapted to a wide range of host plants in both summer and winter seasons. Of the five plants tested, Jhinga, *Luffa acutangulata* Roxb. (Cucurbit plant) was more seriously affected by the attack of this beetle in summer. The life cycle was completed in an average of 19.5 days and the population reached the maximum in late August and declined in late November. The mortality of eggs on jhinga was lower than that on other plants. The longevity of the beetle varied slightly on different species of host-plants. The male beetle lived on an average of 29.8 days on jhinga and the female one lived on an average of 34.5 days on brinjal plant. The longevity of the male beetle increased slightly on pumpkin, *Cucurbita pepo* Dc. Fecundity of the female beetle was high on brinjal.

Agr. 77 Khan, A.B., and M. Ahmad. 1970. **External anatomy of the adult *Epilachna 12-punctata* Mulsant and its comparison with *E. 28-punctata* [Fabricius] [Coleoptera: Coccinellidae].** *M.Sc. Ag. Thesis, East Pakistan Agr. Univ. (MS). 60 p.*

Detailed external anatomy of the adult *Epilachna 12-punctata* Mulssant, a major pest of some solanaceous and cucurbitaceous plants in East Pakistan was described and illustrated. A comparative study relating to the body size, number and pattern of elytral spots, and the genitalia was also made to show its difference from a closely related species, *E. 28-punctata* (Fabricius).

Genetics and Plant Breeding

Agr. 78 Choudhury, A. R. 1965. **The use of selective gamatocide in plant breeding.** *Pakistan J. Sci.* 17(1) : 51-57.

In the course of the discussion on the comparative easiness of the utilization of chemically induced male sterility in the breeding of hybrid crops, the author has indicated that chemical induction could avoid the problems involved in the application of male sterility controlled by genetic factors. The author has also discussed in detail the subject in reference to the findings of different investigators on the various problems concerning the techniques of induction of male sterility by agents other than chemicals.

Agr. 79 Choudhury, A.R. 1966. **Studies on chemically induced male sterility in plants.** *Pakistan J. Sci.* 18(5 & 6) : 175-188.

Male sterility induced by treating plants with sodium 2, 3-dichloroisobutyrate (FW-450) was reported by Eaton (1957) for cotton, and Wit (1960) for beet and clover. Experiments have been carried out to test the effect of FW-450 on a wider range of plant species.

The following ornamental annuals representing six different families were sprayed with definite families were sprayed with definite quantities of aqueous solutions of FW-450 for varying periods: *Adonis aestivalis*, *Anagallis linifolia*, *Collinsia bicolor*, *Gypsophila elegans*, *Iberis umbellata*, *Linaria reticulata*, *Malcolmia maritima*, *Papaver alpinum* and *Silene pendula*.

Results showed that treatment with FW-450 could induce a considerable amount of male sterility in *Gypsophila*, *Iberis* and *Linaria* during the early part of the flowering period without any serious effect on growth of the plants and flowering. In *Collinsia* and *Anagallis* in spite of uniform treatments, some individuals responded to the treatment while others remained unaffected. In the other species tested, the results showed no evidence of any effect on male sterility.

Even in those species showing the effect, there were, however, some inconsistencies in the amount of effect between anthers of the same flower, between flowers of the same plant and between plants of the same species.

Results of these preliminary experiments showed that treatment with FW-450 can lead to degeneration of pollen grains in plants of widely different families.

Agr. 80 Choudhury, A. R. 1967. **Abnormal microsporogenesis induced by FW-450 (NA 2, 2-Dichloroisobutyrate) *Gypsophila elegans*.** *Pakistan J. Sci. Res.* 19(2 & 3): 83-89.

Plants of *Gypsophila elegans* were treated with a 0-1% aqueous solution of FW-450. A total quantity of 22.5 ml. and 52.5 was applied per plant at 7 and 11 weekly intervals. Some plants were sprayed with water to serve as controls.

Pollen development in the treated plants was studied in detail to find the stage at which FW-450 takes effect. Pollen development was studied in control plants for comparison.

Results of this study showed that meiosis in the PMCs from the control plants was normal leading to the formation of well developed pollen grains.

PMC's from the treated plants on the other hand, showed abnormalities like unequal distribution of chromosomes during anaphase I and II, leading to the formation of abnormal tetrads containing some micronuclei in addition to abnormal microspores.

Probable causes suggested for this abnormality are defective synapsis during prophase I or a kind of partial spindle effect at metaphase I induced by FW-450.

Earlier experiments carried out by the author showed that when 7.5 ml. of a 0.1% solution were applied at three weekly intervals, the treatment caused abortion of pollen grains only prior to their maturity in this plant, without inducing any apparent effect on meiotic division in the pollen mother cells.

This difference of results might be due to the difference in the quantities of FW-450 applied during the two experiments.

Agr. 81 Choudhury, A. R. 1971. **The relationship between genetic system and the relative importance of genetic recombination vs. genetic mutation in the evolution of species.** *Pakistan J. Sci.* 2(5 & 6) : 253-257.

The author has outlined the modern concept on gene mutation in the light of Watson and Crick's hypothesis, and given critical evaluation of the importance of gene mutation versus genetic recombination in the process of organic evolution.

During the course of the discussion on the relative importance of gene mutation, genetic recombination and genetic systems, he has pointed out that gene mutation is the basic requirement on which genetic recombination work in cooperation with natural selection to build up genetic systems in the creation of different isolating mechanisms to lead the way to organic speciation in space and time.

Agr. 82 Karim, M. A. and A. Haque. 1972. **Study of the karyotypes of some *Digitaria* species using a new and more efficient cytological technique.** *M.Sc. Ag. Thesis, Bangladesh Agr. Univ. (MS).* 29 p.

Mitotic studies were made on three species of the genus *Digitaria* namely, *D. sanguinalis* (L.) Scop, *D. microbachne* (Presl) Henr., and *D. timorensis* (Kunth) Bal. The conventional cytological methods being proved to be completely inadequate to give good preparations, a new completely satisfactory method was evolved which makes use of treating the root tissues with rather very concentrated HCl to dissolve the middle Lamellae and to soften the cells followed by staining with Heidenhain's haematoxylin stain.

D. sanguinalis and *D. timorensis* are hexaploid and octoploid having $2n = 54$, $2n = 72$ chromosomes respectively. *D. microbachne* has $2n = 62$ chromosomes. The karyological observations showed that there is only one pair of satellited chromosomes in each of the three species. The morphology of the chromosomes showed that the karyotype of any one of these species is dissimilar to any other of the species. The observations on the long arm : short arm ratio gave dissimilar figures for chromosomes within the species as well as between the species. When all the past and present chromosome counts are taken into consideration it becomes obligatory to conclude that the polyploidy has played an important role in the evolution of plants in this genus.

Agr. 83 Haque, A. and M. A. Hossain. 1973. **Observations on the chromosomes of some *Rauwolfia* species.** *Bangladesh J. Bot.* 2(1) : 101-111.

Observations on the mitotic chromosomes of five species of *Rauwolfia* showed that *R. serpentina*, *R. mombasiana*, *R. vomitoria* were diploids ($2n = 22$), *R. caffera* a tetraploid ($2n = 44$) and *R. canescens* a hexaploid ($2n = 66$). The karyotype analyses were carried out in detail in three diploid and single tetraploid species. *R. serpentina* was found to possess two pairs of satellited chromosomes, differing in their morphology. The remaining three species (two diploids and one tetraploid) showed only one pair of satellited chromosomes. In all four species, the traband was attached to the longer arm of the satellited chromosomes. The gap between the traband and the chromosome was conspicuously large. The presence of a single pair of satellited chromosomes in the tetraploid species and the existence of conspicuous morphological differences in chromosomes between the species, suggest that much structural change has taken place in the chromosomes in these species during the process of their evolution.

The observations on the meiotic chromosomes were made on all the four species. Pachytene was studied only in *R. serpentina*. The pachytene bivalents clearly showed the chromosome gradient they were significantly broader in the central region and narrower towards the end. Of the two satellited pairs in *R. serpentina*, only one was seen attached to the single nucleolus. The chromosomes of *R. caffera*, though observably smallest, its chiasma frequency per bivalent was the highest. The degree of terminalization of chiasmata was the highest in *R. serpentina* and lowest in *R. canescens*.

Plant Pathology

Agr. 84 Ishaque, M. 1962. **Fungi on crop plants of East Pakistan.** *Proc. 14th Pakistan Sci. Conf., Abst : Sec. A-62.*

In the work of knowing the fungi that occur in East Pakistan and cause plant diseases, collections were made from different places of the province and the fungi identified. So far 221 plant disease specimens have been identified and preserved in the mycological herbarium. Among the fungi recorded, 28 have been found on cereals, 15 on fibre plants, 24 on vegetables, 6 on oilseed crops, 33 on fruit plants, 5 on sugar plants, 15 on ornamental

plants, 3 on timber plants, 11 on drug and spices and 30 on grasses and other miscellaneous weed plants growing around crop plants.

Fungi recorded have been classified and found that 9 belong to *Phycomycetes*, 11 to *Ascomycetes*, 16 to *Basidiomycetes* 97 to *fungi imperfecti* and 3 belong to *Mycelia sterilia*.

The genus *Cercospora* has been found to occur on the largest number (42) hosts.

Agr. 85 Ahmed, H. U. 1972. **Carbon and vitamin utilization of highly and weakly virulent isolates of *Colletotrichum falcatum* Went.** *Acta. Phytopathological*, 7(4) : 395-399.

Both highly and weakly virulent isolates of *Colletotrichum falcatum* Went grew well on sucrose, glucose, levulose, galactose, raffinose and soluble starch. Both isolates sporulated well on sucrose, soluble starch, glucose, mannitol, galactose, lactose, maltose sorbitol, raffinose, levulose and arabinose. Medium with biotin; thiamine, and biotin and thiamine were best for growth and sporulation of both isolates. In general, there was no correlation between growth and virulence, although in some treatments the isolates differed in growth. A good correlated existed between virulence and sporulation, the highly virulent isolate produced significantly more spores than the weakly virulent isolates.

Agr. 86 Ahmed, H. U. and A. K. M. Shahjahan, 1972. **Morphology and sporulation of different isolates of *Colletotrichum falcatum* Went.** *Nucleus*, 9(1-2): 115-116.

Six isolates of *Colletotrichum falcatum* Went, the causal organism of redroot of sugarcane, were studied. The mycelium is hyaline, septate and branched. They measure 2.9 to 5.1 in diameter. The setal measure 1000.0 to 200.0 in length. The spores are hyaline, one celled, falcate and measured 12.0 to 50.0 in length and 3.6 and 7.5 in width. The colonies of six isolates were medium growing, spreading, cottony and zonate. There were variations in the formation and colour of spore masses among the isolates. Isolates 1, 2 and 3 sporulated more readily than the rest. Isolate 6 had moderate sporulation while isolates 4 and 5 produced lowest number of spores.

Agr. 87 Ahmed, H.U. 1972. **Effect of media and hydrogen ion concentrations on the growth and sporulation of highly and weakly virulent isolates of *Colletotrichum falcatum*.** *Pakistan J. Sci. Res.*, 24(1-2).

Eighteen different media and ten levels of hydrogen ion concentrations were tried to find out the best ones for the growth and sporulation of highly and weakly virulent isolates of *Colletotrichum falcatum* Went. Both isolates grew well on oat meal, potato dextrose, corn meal, yeast extract milt extract, nutrient dextrose, sugarcane stalk decoction, Tanaka's and Leonian's agar media. However, oat meal agar medium was best for growth and sporulation. The isolates were able to grow and sporulate at a pH range of 4.0 to 10.0, the optimum being at pH 5.5 to 6.5 for sporulation. Growth difference between the isolates was significant, while sporulation was significantly higher in case of highly virulent isolate.

Agr. 88 Shahjahan, A.K.M. and H.U. Ahmed, 1972. **Effect of radiation on the growth behaviour of *Colletotrichum falcatum* Went.** *Nucl. Sci. Appl.*, 6(A) : 54-56.

The fungus *Colletotrichum falcatum* Went was subjected to irradiation from Co⁶⁰ gamma source with the dose of 0, 25, 50, 75, 100 and 125 Kr. The fungus grew and sporulated well on all doses with slight variation. No marked difference in the morphology and colony characters of the fungus was observed to the dose up to 125 Kr.

Agr. 89 Ahmed, H. U. 1973. **Nitrogen utilization of highly and weakly virulent isolates of *Colletotrichum falcatum* Went.,** *Mycopath. Mycol. Appl.* 50(4) : 323-327.

Nine inorganic nitrogenous compounds and sixteen amino acids were used to study the growth and sporulation of highly and weakly virulent isolates of *Colletotrichum falcatum* Went. Potassium nitrate, sodium nitrate, calcium nitrate supported good growth, while ammonium phosphate, potassium nitrate and sodium nitrate supported good sporulation of both isolates. Among the amino acids testes, glycine and LD-alanine were best for growth, and LD-threonine, L-Leucine, DL-tyrosine, DL-serine, DL-phenylalanine and L-cystine for sporulation. No correlation existed between virulence and growth but the highly virulent isolate sporulated significantly more than the weakly virulent isolate.

Soil Chemistry

Agr. 90 Bhuiyan, Z. H. and F. R. Khan, 1964. **Exchangeable sodium in the calcareous alluvium of Khulna** *Pakistan J. Soil. Sci. (MS)*.

An attempt has been made to be apprised to the amount and distribution of exchangeable sodium in the calcareous alluvium in Khulna, which is inundated by saline tidal water.

The sample of the ground water was analysed and was found to be highly saline, the principal cation being Na⁺ and anion chloride. The pH of the soil at different depth varies from 7.1 to 7.8, the organic matter contents are low. Soil at the lower depths is relatively high in calcium carbonate.

Agr. 91 Khan, D. H. and M. Z. Haque. 1965. **Volatilization loss of nitrogen from urea added to some soil of East Pakistan.** *J. Sci. Fad. Agr.* 16.

A high (20-70%) loss of N, added as urea, due to volatilization was observed in some soils of East Pakistan under laboratory conditions. This loss was maximum within the first week, as was the rate of hydrolysis to ammonium carbonate, N-loss was maximum in a calcareous soil, minimum in an acid soil and medium in near neutral soils. Soil pH increased after urea application and declined after two weeks.

Placing urea 2 inches below the surface, markedly inhibited the loss of gaseous-N, recovery being 44-89% of total loss. Association of T. S. P. with urea at depth placement further minimises loss of N.

Agr. 92 Ahmed, F. 1967. **Mechanism and kinetics of phosphate and sulphate adsorption and the study of their isotopic exchange behaviour in soil by radio isotope tracer technique.** *M.Sc. Thesis, Dac. Univ. (MS)*

For the study, soils were collected from different parts of East Pakistan representing different soil tracts. Required physical and chemical analysis of the soils was done in order to understand their characteristics.

Mechanism of phosphate and sulphate adsorption, reaction kinetics of phosphate and sulphate adsorption and the importance of solution concentration in the determination of isotopically exchangeable phosphate, and sulphate have been investigated by using radioactive phosphorus (P^{32}) and sulphur (S^{35}).

Agr. 93 Aylmore, L. A. G., M. Karim. and J. P. Quirk, 1967. **Adsorption and desorption of sulphate ions by soil constituents.** *Soil Sci. 103 : 12-15.*

The shape and reversibility with respect to concentration of the adsorption isotherms for sulphate ions on hematite, pseudoboemite and kaolinite clay have been examined at equilibrium concentration up to 100 m.e. per L. The isotherms for the two oxides conform to a langmurtype equation and are almost completely irreversible with respect to equilibrium concentration. On the other hand the isotherm for the kaolinite clays exhibit two distinct regions of adsorption and are largely reversible with respect to equilibrium concentration.

It is apparent that the adsorption of sulphate by soil constituents occurs at a number of energetically different reaction sites and cannot be adequately described by a single equation at all concentrations.

The proportion of clay minerals in soil is likely to be much higher than those of iron and aluminium oxides. While the sulphate adsorbed on the kaolinite clay is weakly held and easily released, that sorbed on iron or aluminium oxides as soil constituent will be highly resistant to leaching but may also be less available for plant.

Agr. 94 Ahmed, F., M. Karim and A. Islam. 1968. **Study of the isotopic exchange behaviour of sulphate in soils as related to equilibrium.** *Pakistan J. Soil Sci. A(2) : 1-7.*

No information regarding solution concentration and time of shaking in determining isotopically exchangeable sulphate is available. Subbiah *et al.* determined isotopically exchangeable sulphate using the method recommended by Russel for phosphorus.

This study was carried out to find out a suitable solution concentration at which isotopically exchangeable sulphate can be determined accurately for different types of soil. The results suggest that for any one type of soil solution, concentration greater than 10 ppm S is unsuitable and sensitivity of the method is equally affected.

Agr. 95 Aylmore, L. A. G., M. Karim and J. P. Quirk. 1968. **Leaching of fertilizer ions in soil columns.** *9th Int. Congress Soil Sci. 1* : 143-153.

The movement of non-reactive and of reactive ions through columns containing artificial soils has been studied and the results compared with the distributions predicted by the chromatographic theories. Comparatively good agreement between experimental and theoretical distributions was obtained under these controlled conditions for both non-reactive and reactive species. The results, however, illustrate the dependence of the progressive adsorption-desorption process by which the movement of a particular ionic species occurs on the presence of other ions, pH value and the complexities of soil constitution. The factors make a generalized theoretical approach to the movement of ions in solution through soils extremely difficult.

Agr. 96 Hesse, P. R. 1968. **Myths of soil analysis.** *Pakistan J. Soil Sci. 4(1)* : 1-7.

Some widely held misconceptions regarding the purpose of soil analysis are discussed. Special emphasis is laid upon the mistaken idea that a soil is analyzed to determine its fertility. The reliability and interpretation of soil analyses in relation to method are discussed.

Agr. 97 Hussain, M.S., M.A. Mujub and S. Rahman. 1969. **Distribution of free iron and manganese oxides in the soils of the tippera surface, East Pakistan.** *Pakistan J. Soil Sci. 5(2)* : 37-44.

The profile distribution of free iron and manganese oxides was studied in six typical soil series from the Tippera Surface. Free iron oxide content in these soils ranged from 6 to 43 mg%. In all the soils there was a preferential enrichment of free iron oxides near the surface which gradually decreased down the profile. Free manganese oxides on the other hand showed a definite enrichment in the lower horizons of all the soils. Thus, free iron and free manganese oxides showed a reverse distribution pattern in the soil profiles. Free iron oxides showed a negative correlation with pH and a positive correlation with organic matter in these soils. Within each individual profile free manganese oxides showed a positive correlation with pH and a negative correlation with organic matter. The content and distribution of free iron and free manganese oxides in these soils was thought to be influenced by seasonal flooding, fluctuation of the ground water table with season, soil pH, rate of oxygen diffusion from surface downward and the specific ionic characteristic of iron and manganese.

Agr. 98 Bhuiyan, Z. H., M. S. Hoque and M. A. Mahtab, 1970. **Some physical and chemical studies on the oldest Brahmaputra Floodplain soils of Haluaghat, Mymensingh.** *Nucleus, 7 (3)* : 172-177.

The physical and chemical properties of the flood plain soils of the Haluaghat area, Mymensingh, do not vary markedly between the two soil types. The nitrogen and organic carbon content of the soils shows a gradual decrease with depth.

The vertical distribution of total phosphorus and clay content does not show any regularity. The highest P_2O_5 content of 0.036% was found in the sub-surface soils of the Dhara silty loam

and a clay content of 33.08% was found in the sub-surface soils of Dhara silty clay loam. Studies on total potassium calcium, magnesium, iron and manganese contents show a similar distribution pattern with depth. These show a gradual increase with depth and the highest values were observed in sub-soils and the lowest in top soils.

The pH value ranges within narrow limits of 5.10-6.85, and in the soils varies from moderately acidic in the surface soils to slightly acidic in the sub-soils. The cation exchange capacity ranges from 9.15 to 15.42 m.e.% with the highest in the top soil of the Dhara silty clay loam. The total exchangeable cations range from 5.68 to 8.64 m.e.% with the highest value in the sub-soil of the Dhara silty clay loam. the percentage base saturation increases with depth except in the Dhara silty loam at locations 1 and 2 and it varies from 64.60 to 65.99%. Location 4 showed the highest base saturation.

Agr. 99 Islam, A., T. H. Khan and M. Rahman, 1970. **Retention of calcium, magnesium, copper, zinc and iron by humic acids.** *Pakistan J. Soil Sci.* 6(1) : 45-58.

Two types of grouping function in the retention of calcium and magnesium ions while four types of grouping function in the retention of Cu, Zn and Fe ions. The relative stability of the complexes formed by the combination of the metal ions to humic acid fraction followed following sequence : $Mg < Ca < Zn < Cu < Fe$. The humic acid fractions collected from the four sources gave elution curves of the same general nature but the retention capacity of the humic acid fraction collected from Maghbazar high land soil was lower compared to other three samples of humic acid. This was associated with less intense decomposition of the organic matter present in the soil.

Agr. 100 Rahman, S., M. Karim, M. Rahman and I. U. Ahmed. 1970. **Rb⁸⁶ as tracer for potassium. II. Comparative fixation of potassium and rubidium by different soils.** *Pakistan J. Soil Sci.* 6 (2) : 17-24.

Soils were collected from Dhamrai. Uthly and Meherpur on the basis of their differences in texture as per soil survey report. Soils were treated with Rb and K in different doses and combinations to study their respective fixation. It was observed that neither Rb nor K has an effect on the fixation of one another. Rather fixation of both Rb and K varied with their respective doses. Dhamrai soil with low clay content fixed lowest amount of both Rb and K, while Meherpur soil having high clay content fixed maximum Rb and K. Again in general, more percentage of the added Rb has been found to be fixed than added K at identical condition. This aspect of differential fixation must be given due attention while considering Rb⁸⁶ as a tracer for K.

Agr. 101 Rahman, M. S. 1970. **Rubidium-potassium relationship studies in soil-plant system and use of rubidium (Rb^{86}) as tracer for potassium.** *M. Sc. Thesis, Dac. Univ. (MS)*.

The present investigation was undertaken to study where Rb^{86} would be a suitable tracer for potassium in uptake studies with rice plant as test crop. The distribution factor as obtained in the present experimental condition is not sufficient for using "correction method" as a technique for using Rb^{86} in the tracer studies for potassium. The procedure followed here being first of its nature and much simpler, should be continued before throwing away the possibility of utilizing the "correction method" for the purpose.

Agr. 102 Rahman, S., M. Karim, M. Rahman and I. U. Ahmed, 1970. **Rb^{86} as a tracer for potassium. II comparative fixation of potassium and Rubidium by different soils.** *Pakistan J. Soil Sci. B 1(2) : 17-24*.

Rubidium-potassium fixation study was made from soils collected from the unfertilized cultivated field of Dhamrai, Uthly and Meherpur in the district of Dacca. Soils were treated with Rb and K in different doses and combinations to study their respective fixation. It has been observed that neither Rb nor K has an effect on the fixation of one another. Rather the fixation of both rubidium and potassium varied with their respective doses. Dhamrai soil with low clay content fixes lowest amount of both Rb and K, while Meherpur soil with high clay content fixed maximum Rb and K. Again in general, more percentage of the added Rb has been found to be fixed than added K at identical condition. This aspect of differential fixation must be given due attention while considering Rb^{86} as a tracer for K.

Agr. 103 Bhuiya, Z. H. 1971. **The oxidation of elemental sulphur in soil.** *Bangladesh J. Soil Sci. 3(1) : 55-57*.

Several factors that influence the oxidation of elementation of sulphur in soils include the microfloral population, moisture and pH. Sulphur is one of the most effective agents for increasing soil acidity. Flours of sulphur reacted quickly in lowering the soil pH from around 6 to 3 at the end of 6 weeks. Incubation at $37^{\circ}C$ and moisture at field capacity responded early, whereas flooded soils showed similar pH values after 12 weeks.

Agr. 104 Bhuiya, Z. H., M. A. Sattar and M. S. Islam, 1972. **Transformation of urea-N in Jamuna and Tista Floodplain soil.** *Bangladesh J. Soil Sci. (in press) (MS)*.

In a laboratory experiment 4 levels of urea-N were incorporated to determine the concentrations of ammonium and nitrate-N and pH changes at field capacity moisture. The ammonium and nitrate-N concentration and pH changes were determined from the incubated samples at an interval of 6 days and continued up to 42 days. Results revealed that urea applications increased the ammonium-N concentration up to 12 days of incubation and decreased gradually with time. The concentration of ammonium-N increased with increasing rates of urea-N application, Nitrate-n concentration gradually increased with increasing rate of

urea-N application up to 12 days and then decreased gradually with time. The levels of urea-N also altered the soil pH.

Agr. 105 Miah, M. M. and M. Idris. 1972. **Transformation of nitrogen from urea fertilizer in soil under different moisture condition at room temperature.** *M.Sc. Ag. Thesis, Bangladesh Agr. Univ. (MS).* 47 p.

The soil sample at plough depth (0-6") representing the Tista Flood Plain Soil (pH 6.7) was used for the experiment. There were 81 plastic containers each containing one pound of sieved soils and the samples were treated @ 120 lbs N/a. The study shows that urea hydrolysis can take place in the soil at a wide range of moisture content (from air dry to saturated condition). Nitrification on the other hand can proceed only under air dry and field capacity moisture conditions but not under saturated conditions. The pH of the soil increases as long as the hydrolysis of urea to ammonium carbonate is in progress and it drops continuously along with the nitrification.

Agr. 106 Sattar, M. A. 1972. **A study on the transformation of urea-N in soils.** *M.Sc. Ag. Thesis, Bangladesh Agr. Univ. (MS).* 199 p.

A laboratory experiment was conducted with 4 levels of urea-N and 3 major Bangladesh soils and incubated for 42 days at an interval of 6 days. Urea-N up to 12 days and decreased thereafter. The nitrate-N content gradually increased with incubation time. The ammonium and nitrate-N increased with increasing rates of applied urea-N. pH values increased during ammonification and decreased during nitrification. Organic matter status of the soils decreased gradually with time and also decreased with time and also decreased with increasing rates of urea-N application. Available phosphorus contents increased up to 24 days and decreased with the progress of incubation time. An increase in the level of urea-N caused a gradual increase in available phosphorus concentrations.

Agr. 107 Bhuiya, Z. H., M. A. Sattar and M. S. Islam, 1973. **Physical and chemical studies on some soils of Bangladesh.** *J. Asiatic Soc. Bangladesh. (in press) (MS).*

The soil samples were collected from seven different soil tracts of Bangladesh at 0-6 and 6-12 inches depths. Fine sand was the dominant fraction in Noncalcareous Dark grey Floodplain, Calcareous Dark Grey Floodplain and Calcareous Dark Brown Floodplain and Brown Hill; silt was the dominant fraction in Grey Floodplain and Noncalcareous Brown Floodplain, Grey Floodplain and Peat soils and clay was the dominant fraction in Red Brown Terrace soil. Smaller values of particle and higher values of bulk densities were observed at lower depths. Total pore spaces were higher in the surface soils.

The soils showed acidic, neutral and alkaline reaction. They low content of organic carbon and slightly higher cation exchange capacities were observed at lower depths. The soils showed nitrogen and phosphorus deficiency but hardly showed any potassium deficiency.

Agr. 108 Bhuiya, Z. H., M. A. Sattar and M. S. Islam, 1973. **Transformation of urea-N in saline tidal zone soil.** *Bangladesh J. Biol. Agr. Sci.* 2(1) : 11-15.

In a laboratory experiment 4 levels of Saline Tidal Zone Soil of Bangladesh was used to determine the concentrations of ammonium and nitrate-N, pH change, and organic carbon content at an interval of 6 days and continued upto 42 days at field capacity moisture. Urea applications increased the ammonium-N up to 6 days increased gradually with incubation time. Ammonium and nitrate-N increased with increasing rates of applied urea-N. Soil pH increased during ammonification and decreased during the periods of nitrification. The organic carbon contents decreased with increasing incubation time and also with increasing rates the values decreased.

Agr. 109 Bhuiya, Z. H., M. S. Sattar and M. S. Islam, 1974. **Transformation of urea-N in Madhupur Red Soil.** *J. Ind. Soc. Soil Sci.* 22(1) : 31-35.

In a laboratory experiment 4 levels of urea-N were incorporated with Madhupur Red Soil of Bangladesh to determine the concentration of ammonium and nitrate-N, soil pH changes and organic matter contents at field capacity moisture with the periods from 6-42 days. urea application increased the ammonium-N concentration upto 12 days of incubation and then decreased gradually with time. The nitrate-N increased with time and decreased at the end of the experiment. The ammonium and nitrate-N concentrations increased with increasing rates of applied urea-N. Soil pH increased upto 12 days of incubation and decreased thereafter. The levels of urea-N also altered the soil pH value. The organic matter contents decreased gradually with increasing rates of urea-N application at different periods of incubation.

Agr. 110 Bhuiya, Z. H. and D. F. Rothwell, 1973. **Conversion of DDT to DDD in flooded soil.** *Plant and Soil.* 39(1) : 193-196.

Anaerobic conditions obtained by flooding the soil caused reduction dechlorination of p, p',-DDT and its conversion to P, P'-DDD was enhanced under water-logged conditions creating or favouring anerobiosis. The DDT showed recalcitrance in the soil kept at 15% moisture.

More o, p'-DDT was lost from the flooded soil. Similar amounts of p, p'DDE were detected in all of the three levels of technical DDT treatments and the concentrations were not significantly different under both aerobic and anerobic conditions.

Agr. 111 Eağub, M. and L. Pavel, 1973. **Investigation of three czechoslovak soil profiles on the basis of genetic horizons. I. Physical and chemical properties.** *Rostlinna Vyroba (Prague, Czechoslovakia) (MS)*

This paper characterized the physical and chemical properties of three Czechoslovak soil profiles, namely Kozojedly-an illimerised chernozem developed on loess, Kuri-Central-European brown soil, weakly pseudogley on loess loam, and Tursko-a chernozem developed on loess, on the basis of genetic horizons. The properties included bulk density,

specific gravity, moisture content, capillary water capacity and also the mechanical composition of soil separates. The chemical properties were studied by determining soil pH, C. E. C., contents of organic carbon, organic matter, CaCO_3 , extractable Fe_2O_3 and Al_2O_3 in soils and also the elemental oxides, such as, SiO_2 , Al_2O_3 , MnO , TiO_2 , CaO , MgO , and K_2O in the fractions of clay ($<2\mu\text{m}$) and nonclay ($>2\mu\text{m}$) and in the whole soil ($<2\mu\text{m}$). The data in the body of the text were self-explanatory.

Soil Fertility

Agr. 112 Karim, M. 1960. **Dissolution of fertilizer phosphates**. *M. S. Thesis, University of Missouri, U. S. A. (MS)*

The dissolution and hence availability of various insoluble phosphates for plant uptake will depend on the chemistry of this and associated salts. This study showed that certain forms of phosphate fertilizer (e.g. single and triple-superphosphate) can increase solubility of insoluble phosphate like rock-phosphate.

Agr. 113 Ahmed Sultana and A. Q. M. B. Karim, 1964. **Study of potassium fixation in soils with depths**. *M. Sc. Thesis, Dac. Univ. (MS)*

Four soil samples were collected from high and lowland areas of two different localities, namely red soils and new alluvium soils. Fixation of potassium was studied for different depths e.g. (0-6", 6-12", 12-18", and 18-24") at different intervals of time (15, 30, 45, 60 and 90 days).

It was observed that K-fixation was minimum at the surface layer of the red soils which increased with increasing depth, except 18-24" depth where the fixation was slightly lower. This trend was found amongst all the intervals of time.

On the contrary, the new alluvium soils fixed maximum amount of K on the surface layer (0-6") while it decreased with increasing depth during all the time intervals.

The intensity of K-fixation progressively increased with the increasing number of days at all depths of soils and it was found to be almost directly proportional to the amount of clay content present in these soils.

Agr. 114 Khan, D. H. and A. C. Roy. 1964. **Study on the phosphate retention and release in some East Pakistan soils**. *Plant and Soil*. 21(3) : 365-376.

Four soils of different geo-morphological tracts of East Pakistan were studied for P-retention from native and added P sources and release of fixed P by Na-silicate and / or CaCO_3 treatment.

Phosphorus retention was markedly high in Tejgaon clay (a ferruginous soil) and in Isurdy silty loam (a calcareous alluvium). Tarabo- and Rangpur silty loams (light-textured soils with low Fe_2O_3 and CaO contents) were found to retain moderate amounts of phosphate. The values for absorbed P varied with soils and these were appreciable for all soils, irrespective of soil types.

In all soils but Isurdy silty loam P release increased with increasing rates of added Na silicate upto 0.015 normality. In Isurdy silty loam, however, this effect levelled off at 0.075 normality and this was explained by inactivation of Na-silicate in the presence of free CaCO_3 in this soil.

The effect of CaCO_3 on P release was found to be positive in Tejgaon clay and negative in Tarabo clay and negative in Tarabo- and Rangpur silty loams. In Tejgaon clay, combined applications of Na silicate and CaCO_3 enhanced P release than when applied singly. This trend was not observed in other soils.

Agr. 115 Hasan, K. A. and A. G. Pollard, 1975. **Studies on the mechanism of phosphate fixation and release in acid soil by electrodialysis.** *Pakistan J. Soil Sci.* 1-9.

Studies were made to elucidate the mechanism of phosphate fixation in acid soils with particular reference to the part played by the hydrated oxides of iron and aluminium in the process by following the removal of phosphate by electrodialysis from acid soils under different conditions of treatments.

In an acid soil hydrated oxides of aluminium appear to absorb phosphates from solution in the electrodialysable and hence in the ionisable form whereas hydrated oxides of iron absorb phosphates in the proportion equivalent to that required to satisfy 2 of the hydroxyl groups in the non electrodialysable hence in un-ionisable form.

Agr. 116 Islam, M. A. and A. F. M. H. Rahman. 1965. **Quantitative estimation of the phosphorus requirement of soils.** *Pakistan J. Soil Sci.* 1(2) : 37-43.

A formula has been developed for quantitative estimation of phosphorus requirement of soils.

The formula is $X = \frac{P \times D}{100} - E$, where;

X = amount in mgm of P_2O_5 to be added to 100 gm soil.

P = phosphate fixing capacity of soil in mgm / 100 gm soil.

D = Degree of phosphate saturation of the soil after adding X amount of P_2O_5

E = Exchangeable P_2O_5 in mgm/100 gm soil.

The phosphorus requirement of a number of soils have been determined by the application of this formula.

Both by field and potculture experiments, the formula has been found to be suitable for calculating the phosphorus requirement of soils. The limitations of the formula have also been discussed.

Agr. 117 Islam, M. A. 1966. **Fertilizer problems of East Pakistan.** *Pakistan J. Soil Sci.* 2 (1) : 7-11.

East Pakistan, with 55 million people occupying some 50,000 square miles and this population increasing at the rate of 1 million every year is one of the most densely populated countries in the world. With the provinces' economy 80 per cent dependent on agricultural production and with little likelihood of this proportion being reduced substantially in near future because of lack of alternative natural resources, we shall have to squeeze out every year more and more from the soils of East Pakistan. This increase in production can only be achieved with adequate knowledge of the distribution, properties and potentialities of the soils that are to provide it.

From the statistical data, the author found out some fertilizer problems of Pakistan which were as follows :

- 1) The application of fertilizers can increase the yield of paddy by 50-100% and of sugarcane by more than 100%.
- 2) Cropping pattern changes soil structure, permeability, cohesion. Plasticity, consistence, and gaseous exchange between the soil and the air, the most chemical effect of submergence is the change of Redoxpotential that is a reduction of oxidation reduction potential.
- 3) The nutrient status and fertilizer response of the same soil are different in dry and submerged states.
- 4) The main causes to poor production are regarded as (i) primitive methods of cultivation, (ii) poor varieties of crops (iii) poor fertility of soils, and (iv) destruction by pests and diseases.
- 5) Varietal response of fertilizer.
- 6) NPK fertilizers are best for higher yield of rice and other crops.
- 7) Lack of soil science education.

Agr. 118 Islam, A. and I. R. Chowdhury. 1966. **Phosphorus fixation capacity of some acid soils of East Pakistan.** *Pakistan J. Soil Sci.* 2 (2) : 10-22.

Phosphorus availability of the soils increased significantly with the increased level of phosphorus application from 30 to 240 lbs. of phosphorus per acre, while 15 lbs. of phosphorus per acre could not substantially increase the availability except Brahmaputra soil where fixation seemed to be minimum.

Highest phosphorus fixation had taken place in Cox's Bazar soil. This is true with all the methods.

When Acetic Acid method was considered as an index of measurement, lowest fixation had taken place in Brahmaputra soil, Dacca soils ranked between the two.

This high rate of fixation by the three red soils may be due to reaction of phosphate with soluble iron, aluminium and manganese at very low pH, interaction with sesquioxide and hydrated oxides of these elements, adsorption on soil colloids and secondary adsorption by precipitated or adsorbed particles of phosphates.

Fixation in Brahmaputra soil could be attributed to retension by calcium clay on the acid side of neutrality, precipitation with divalent cations around pH 6, physico-chemical sorption and secondary adsorption by precipitated or adsorbed particles of phosphates.

Agr. 119 Ahmed, I. U. and K. M. Idris. 1967. **Effect of N, P and K on the transformation of organic sulfur in acid and calcareous soils at different moisture levels.** *Pakistan J. Soil Sci.* 3 (2) : 30-37.

The effects of N, P and K on the transformation of organic sulfur of the Dacca city waste in acid and calcareous soils at various moisture levels were studied in the laboratory. Applications of N, P and K fertilizers either singly or in a mixture increased the accumulation of water soluble sulfate, thiosulfate and sulfite in acid and calcareous soils over the control. The production of these sulfur compounds was more in the soils at field moisture capacity than at the half field moisture capacity and the waterlogging condition. The application of NPK mixture increased the mineralization of organic sulfur more than the application of either of N, P or K treatments.

Larger amounts of H₂S were produced in the soils at waterlogged condition than at the half-field moisture capacity and field moisture capacity. The production of H₂S was more in acid soils than in calcareous soil, and most of the H₂S was found to be evolved between 12th and 16th weeks of incubations. Organic sulfur in both the soils was considerably lower in the N, P and K treated soils than in the control soil. There was negligible or no change of total sulfur during the incubation.

Agr. 120 Islam, A. and T. H. Khan. 1967. **Distribution of inorganic phosphates in some soils of East Pakistan.** *Pakistan J. Biol. Agr. Sci.* 10 (1) : 25-30.

NH₄Cl-solution phosphates constituted 0 to 1.0% aluminium phosphate 3.6 to 28.9%, iron phosphate 4.8 to 25.8%, calcium phosphate 18.6 to 77.8% and occluded phosphates 7.9 to 37.8% of the total inorganic phosphates of the soils.

Among the various inorganic phosphates, iron and aluminium phosphates were dominant forms in the acid soils of Savar and Rangpur, while in the alkaline soils of Benerpota, Amritapur and Madaripur, calcium phosphate was the dominant form. The highest percentage

of occluded phosphate was recorded in Savar clay which belonged to the moderately weathered lateritic soils of Madhupur Jungle tract.

Agr. 121 Islam, A. and T. H. Khan. 1967. **Influence of phosphorus fixing agents on the formation of inorganic phosphates in the soil on the addition of phosphatic fertilizers.** *Pakistan J. Soil Sci.* 3(1) : 32-34.

Significant correlation were also obtained between calcium phosphates formed in the soils at both moisture levels and their free CaCO_3 as well as total CaO contents. Therefore, it was concluded that both free CaCO_3 and other forms of calcium were able to fix added phosphorus as calcium phosphate. But the higher correlation coefficients between free CaCO_3 and calcium phosphate formed probably indicated that they were more active in reacting with added phosphates.

Agr. 122 Ahmed, I. U. and A. Rahman. 1968. **Influence of annual flood of Brahmaputra river on the nutrient contents of its floodplains.** *Pakistan J. Soil Sci.* 4(2) : 39-44.

The annual flood of Brahmaputra river increased the exchangeable K, Ca and Mg and available N and P in the soils of its floodplains and consequently improved the fertility status of the soils. Flooding, however, had little or no effect on the mechanical composition of the soils.

Similar increments of nutrients are probably occurred from the floods of other rivers of East Pakistan.

Agr. 123 Roy, A. C. 1969. **Phosphorus-silicon interactions in soils and plants.** *Ph. D. Thesis. Univ. Hawaii, (U. S. A.)* 238 p.

Interactions between phosphorus and silicon were studied in three steps; first laboratory equilibration; second, uptake by plants from culture solutions; and third, uptake by plants from soils.

Phosphorus decreased Si sorption and Si decreased P sorption by soils. The interaction effects of Si and P on P and Si sorption by soils were related to their solubilities in soils as affected by soil pH and mineralogy.

Phosphorus requirements of soils decreased with increasing amounts of residual phosphate and silicate. Residual effects of silicate on phosphorus sorption were inversely related to the amounts of residual phosphate. Extractable soil P increased with increasing amounts of residual silicate.

The distribution of silicon in soil profiles was a function of the amounts of silicate applied and soil pH. There was an inverse relationship between the rates of applied phosphate and Si in soil profiles.

Phosphorus and silicon absorption by plants species. In general, plants which accumulate little Si, absorbed more P in the presence of Si, the reverse was true for plants which accumulate Si. Silicon absorption was depressed in the presence of P.

Pot experiments were conducted to evaluate placement effects in soils on phosphorus-silicon interactions. Placement effects on uptake of these elements by plants varied with plant species.

Agr. 124 Ali, M. B. 1970. **Studies on the plant absorption of selenium from two Pakistani soils as influenced by the applications of nitrogen, phosphate and sulphate.** *Nucleus*, 7 (3) : 126-162.

The experiment was designed as a study on the influence of different additions of N, P, S and Se to two important types of Pakistani Soils, one alluvial soil and one latosol, on the plant uptake of selenium. The experiment was arranged as a conventional pot experiment. *Brassica napus*, L. var. *oleifera* was selected as test crop because of its high response to NP application, with S^{85} and Se^{75} isotopes as tracer.

The purpose of this experiment show is that a heavy NP application caused a decrease of 15-25% in the specific content of Se in the crop grown on the alluvial soil and low in native phosphorus, but when combined with heavy sulphate applications, an increase in the specific content of Se of up to 90% in the crop grown on the latosol resulted. High sulphate applications at low application of NP depressed plant uptake of selenium to less than half of that obtained at low sulphate applications due to antagonistic effects of the selenate ions at the plant mineral uptake.

Application of nitrogen tended to increase the plant uptake of selenium by increased crop production and enhanced the uptake of sulphate, which apparently caused an increase in the selenae/sulphate ratio in the soil solution and thereby also to an increase in the selenium absorption by the crop, especially during the latter part of the vegetation period. The selenium content in the soils used originally low and therefore small amounts of selenium compounds added, i.e. the tracer, were adsorbed to the soil with high energy.

Agr. 125 Aylmore, L. A. G. and M. Karim. 1970. **Dissolution of gypsum, monocalcium phosphate and superphosphate fertilizers in relation to particle size and porous structure.** *Australian J. Soil Res.* 9 : 21-32.

The effect of variations in physical form such as particle size mixing with other materials on the rate of dissolution of sulphate and phosphate from solid fertilizer has been investigated. It is apparent from these results that the degree of sub-division of a solid fertilizer is particularly important in determining its susceptibility to leaching. It has been demonstrated that leaching of sulphate is appreciably restricted when the granule size is 2 mm or greater in diameter. Except when leached immediately after applications the retention of phosphate is determined largely by 'reversion' to the relatively insoluble dicalcium phosphate form.

Combination of sulphate with phosphate in superphosphate or the addition of various additives to gypsum markedly reduce the rate of sulphate leaching. A comparison of pore size distribution suggests that pores within the intermediate range from approx. 500 \AA^0 to 15^5 \AA^0 play a significant part in the dissolution process.

Agr. 126 Habibullah, A. K. M.; D. G. Lewis and D. J. Greenland, 1971. **Influence of iron and aluminium oxides on the absorption of phosphate by some seasonally flooded soils from East Pakistan.** *Trans. Int. Soc. Soil Sci. 5 and 6 comm. West Germany*, 81-92.

A range of soils from East Pakistan, previously characterised by X-ray diffraction, electron-microscopy and other methods have been used to determine the relative importance of different hydrous oxides to their physicochemical characteristics. Phosphate absorption and charge properties have been measured after treatment at pH 1.5 to remove active aluminium hydrous oxides, thionite reduction to remove hydrous oxides of iron and finally 5% sodium carbonate to remove amorphous silica and disordered mono-silicates.

The positive charges of the older soils decreased following the successive treatment to remove 'active' aluminium and iron and amorphous aluminosilicates; phosphate sorption decreased most after removal of iron oxides. Carbonate treatment of the young alluvial soil increased its area and the amount of phosphate sorbed, a result not observed for the other soils studied.

Agr. 127 Khan, D. H. and G. H. Rashid. 1971. **Losses of nitrogen from urea in some soils of Bangladesh.** *J. Sci. Fd. Agr. 7* : 107-112.

An appreciable loss of gaseous N from added urea was recorded in two subtropical soils of Bangladesh under laboratory conditions, markedly accentuated by the presence of decomposable organic materials which increased ammonification and tended to decrease nitrate accumulation. The addition of bonemeal to the soils had little effect.

Agr. 128 Roy, A. C., M. Y. Ali, R. L. Fox and J. A. Silva. 1971. **Influence of calcium silicate on phosphate solubility and availability in hawaiian latosols.** *Proc. Int.' Symp. Soil Fert, Evaln, New Delhi (India) 1* : 757-765.

The influence of silicate on solubility of soil P was determined. Phosphate requirements (sorbed P at 0.2 ppm P in solution) ranged from 240 ppm P for a Kaolinitic soil to 1,400 ppm P for a soil rich in non-crystalline hydrated oxides. Applications of silicate decreased phosphate requirements by about 9 to 43 per cent. The decrease was greater for the Kaolin system and lowest for the hydrated oxides.

Desorption of P increased in the presence of sorbed Si. Residual effects of fertilizing a soil (a fibbsihumox) with 9 tons/ha of calcium silicate slag and 110 kg/ha of P was to decrease P requirements by 500 kg P/ha. Extractable P increased with increasing amounts of silicate initially applied to the soil.

Silicate applied to a P-deficient soil significantly increased dry matter yields of sugarcane (*Saccharum officinarum*). Increased yields were associated with improved plant P nutrition. Silicon in the plants seems to decrease the internal P requirement of sugarcane. This was indicated by relatively large effects of Si on yields when P was at low concentrations in the sheaths.

Agr. 129 Patwary, S. U., S. Ahmed and M. Karim. 1972. **Relative efficiency of rock phosphate and triple superphosphate for rice in Bangladesh soils.** *Inten. Rice Comm. News Leter.* 21(1).

Extension of A-value concept of Fried and Dean has been used to compare the efficiency of rock phosphate and triple superphosphate in order to locate areas on Bangladesh Map according to the relative cost of these two sources. The calcareous and saline soils were found unsuitable for rock phosphate compared to triple superphosphate, whereas acid soils were most suitable on the basis of relative cost efficiencies.

Agr. 130 Bhuiya, Z. H., M. A. Sattar and M. S. Islam, 1973. **Effect of urea on the available phosphorus and organic matter contents of some Bangladesh soils.** *Indian J. Agr. Sci.* 44(3) :

A laboratory study was made to determine the available phosphorus and organic matter contents of three representative soils of Bangladesh at field capacity moisture. The soils were treated with 4 levels of urea-N and incubated for 0-42 days with an interval of 6 days. Application of urea to Jamuna and Tinta Floodplain and Madhupur Red Soils increased the available phosphorus content up to 30 days of incubation and in Saline Tidal Zone Soil up to 24 days and decreased gradually with the progress of incubation and also with an increase in the rate of application of urea.

Agr. 131 Islam, A. and B. Ahmed. 1973. **Distribution of inositol phosphates, phospholipids and nucleic acids and mineralization of inositol phosphates in some Bangladesh soils.** *J. Soil. Sci.* 24(2) : 193-198.

Concentration of inositol phosphates, phospholipids and RNA and its derivatives of tea Bangladesh soils varied between 17.5 and 150 ppm respectively. Variation in inositol phosphates was related to total phosphate and organic phosphate contents. Variation in phospholipids was associated with total phosphate, organic phosphate and organic matter contents whereas the variation in RNA and its derivatives was related to total phosphate contents of the soils. Maximum mineralization of inositol phosphates was obtained in the first 30 days either when incubated with lime or when submerged under water. A moderate rate was observed in the subsequent 30-days incubation period. The mineralization was greater in soil which contained more organic matter and inositol phosphates.

Mineralization also increased with pH. Lignin mineralization as it induced conditions for the proliferation of phosphate transforming organisms.

Agr. 132 Karim, M., F. Ahmed and A. Islam. 1973. **A study of phe adsorption by four Bangladesh soils.** *Geoderma*, 9 : 221-227.

The adsorption curves for four soils were divided into segments I, II and III, Segment I (<2 Mg P/ml equil, conc.) and segment II (2-150 Mg P/ml equil conc. conformed to the langmuir equation similar to that of pure materials like gibbsite, pseudoboehmite and kaolinite. Where as segment II (-75-150 Mg P/ml equil. conc.) conformed to the Freundlich equation and was unlike the previous finding of linear relationship for pure materials.

Soil Genesis

Agr. 133 Brammer, H. 1964. **An outline of the geology and geomorphology of East Pakistan in relation to soil development.** *Pakistan J. Soil Sci.* 1(1) : 1-23.

The Chittagong-Tripura Hills in the south-east consist mainly of steeply-dipping consolidated Tertiary sediments. Topography is strongly dissected and soils are young. Accordant summit levels suggest the possible occurrence of two former erosion surfaces.

Further west, there are three major and four minor areas of uplifted Tertiary and pleistocene sediments forming a dissected pleistocene terrace with which mature and immature latosolic soils are mainly associated.

The Tippera surface in the south-east represents an uplifted block of recent alluvial sediments in which weathering and profile development have just commenced.

Elsewhere, recent alluvial sediments occupy the Himalayan piedmont alluvial plain in the north, the moribund Ganges delta, the recent deltaic flood-plains of Ganges, Tista, Brahmaputra and Meghna rivers, the subsiding Sylhet basin and the coastal saline zone. Undeveloped alluvial soils occur only on the extensive meander floodplains, soils generally have immaturely developed profiles; most constitute low-humic Glei soils, Mangrove swamp soils occur in the south-west and locally along the south-east coast.

Agr. 134 Brammer, H. 1966. **Soils of Bangladesh in relation to agricultural development.** *Pakistan J. Soil Sci.* 2 (1) : 17-39.

Surveys recently commenced indicate that Bangladesh has a wide range of soils. The high fertility of many of them results from their derivation from young, mineral-rich, Himalayan sediments which weather rapidly. Seasonally flooded soils, except where calcareous, show marked fluctuations in top soil reaction between flooded and dry states and quickly develop structure. Seven major parent material merits are recognised. Older sediments in hill and terrace areas mainly have deep acid soils. Problems include excessive monsoon rainfall, dry-season drought, low fertility, steep hill slopes and poor drainage on level terraces. Himalayan piedmont soils are droughty. Fresh water floodplain soils are mainly structured silty clay loam to clays with high base status. Problems include deep or irregular flooding, dry season drought, low nitrogen status and in Ganges alluvium relatively high lime content. The

freshwater tidal floodplain has problems of river erosion and fluctuating salt-water penetration. Saline and acid-sulphate soils present problems in the coastal tidal zone. The Chittagong coastal plain suffers flash floods, dry season drought and locally saline and extremely acid conditons. The last three areas are exposed to cyclonic storms and tidal bores.

Agr. 135 Ahad, S. A. and M. A. Wahed. 1966. **A pedogenic study of soils of Rangamatia Tillas, Fatikchhari, Chattagong.** *Pakistan J. Soil Sci.* 3 (2) : 38-42.

The absence of significant change in the ratios of clay in the profiles and low limit values (silica : sesquioxides ratio from 1.52 to 1.74), low pH value, low to moderate cation exchange capacity of soils (9.8-18.1 m.e.%), decrease of free iron oxides down the profile indicate the soils to be lateritic. The colour also supported this observation. According to Russian school of nomenclature the soils may be termed "Krasnezem" means red soil.

Weighing arguments in its proper perspective, the soils of the area under investigation may be classified as "Tropical Red Earths".

Agr. 136 Hussain, M. S., S. Rahman and A. U. Sarker. **A comparative study of soils developed on younger and older Gangetic alluvia in Rajshahi District.** *Proc. 29th Pakistan Sci. Conf. Abst.* : A-10.

This investigation was undertaken to study the differences in some physical and chemical properties between soils developed on younger and older Gangetic alluvia. It was found that the younger soils have much higher sand content than the old ones, and the amount of clay in the surface horizons of older soils is higher than that in the younger soils. This might be an indication of weathering out of primary sand-sized minerals in the old soils. The cation exchange capacity in the older soils is higher than that in the younger soils. This is because of the presence of higher amount of clay in the older soils.

The cation exchange capacity showed a highly significant correlation ($r=0.97^{**}$) with per cent clay content in these soils. The soils show an average pH (pH with N KCl-pH with H_2O) value of 1.0 pH units and it is difficult to explain such a high pH value in lime-rich soils as these.

In the younger soils calcium carbonate occurs throughout the profile but in the older soils the calcium carbonate has been leached out from the surface horizons. It appears that decalcification is the major process of soil formation in the soils under study.

Agr. 137 Rahman, S., M. S. Hussain and A.U. Sarker. 1968. **A comparative study on the soils developed on younger and older Gangetic Alluvia in Rajshahi district.** *East Pakistan. Pak. J. Soil Sci.* 5 (1) : 1-40.

This investigation deals with a genetic study of some soils developed on the Gangetic alluvium. The major objective of this study was to find out the differences between soils formed on young and old Gangetic alluvia. For this study six soil profiles were collected from

a portion of Rajshahi district, three from the younger surface and three from older surface. Although the soils are classified strictly into young and old soils it is recognized that they actually form a continuum in the landscape in which there are some intergrades which have been ground into either of the above two classes because of convenience.

Agr. 138 Brammer, H. and R. Brinkman. 1967. **A land capability classification for use in East Pakistan.** *Pakistan J. Soil Sci.* 3 (2) : 10-16.

Land capability classification is a method of grouping the soils of an area to show their relative suitability for sustained production of common agricultural crops.

Implicit in the classification is a statement of the potentiality of the soils for improvement. Class I soils will respond best to good management. The lower classes have successively lower potentialities for improvement. This factor is used as a major criterion differentiating class III from class IV soils. In the case of class III soils, improvement to a high level of productivity, although difficult, is considered feasible and economic; in class IV, improvement to a high level of productivity is considered impractical or uneconomic. This aspect is stressed since, under the master plan proposals exist for providing flood protection, drainage and/or irrigation almost throughout East Pakistan within the next twenty year.

Agr. 139 Eaquad, M. 1969. **Evaluation of soil profile development from mineralogical and chemical analyses.** *Reference. Thesis. Prague Agr. Univ., CSSR (MS).* 28 p.

References were collected on the uniformity of soil parent material, evaluation of profile development on the basis of index mineral and chemical analytical data.

Agr. 140 Eaquad, M. 1971. **Evaluation of soil profile development from Mineralogical and chemical analysis.** *Ph. D. Thesis. Prague Agr. Univ., CSSR (MS)* 185 p.

Three characteristic soil profile from different parts of Czechoslovakia were collected and analysed with respect to physical and chemical properties, tests of uniformity of soil profiles, and mineralogical properties. On the basis of chemical and mineralogical data, the loss and gain of soil profile were calculated.

Agr. 141 Eaquad, M. 1972. **Studies on soil profile development : Profile Balance using mineralogical and chemical data of an illemerized chernozem on loess.** *Z. Pfl. Ernah. Bodenk. (West Germany).* 133 : 102-116.

One characteristic soil profile of Czechoslovakia was investigated in evaluating profile balance from mineralogical and chemical analytical data. The uniformity tests showed that the profile Kozojedy (an illemerized chernozem on loess) originated from a fairly homogeneous parent material. The profile balance was calculated by index minerals such as zircon, rutile and quartz and on the other hand by determining the SiO₂ and Al₂O₃ contents of clay and nonclay fractions after Barshad. The results indicated that quartz in the 20-50 µm fraction and the whole soil (<2 mm) yielded a better evaluation than the chemical data. Zircon and rutile

brought about erroneous results and in some cases even the calculation was not possible. On the basis of the results it may be concluded that quartz should be used in the profile balance studies with confidence in order to obtain a relatively precise evaluation; whilst chemical data might be used with limited success only.

Agr. 142 Eaqub, M. 1973. **Soil development from the loess containing slope-solifluction materials of sandstone of odenwald.** *The paper was read at Soil Sci. of West Germany in Giessen held in September.*

The soils of the slope areas of the Odenwald of West Germany raised the controversy among the soil scientists over the exact nature of the deposits and the extent of pedogenic changes due to weathering. Their genesis and morphology were little known or understood, particularly with respect to the effects of two different deposits (viz. sandstone and loess) from which they formed. This study dealt with physical, pedomorphological and mineralogical properties of solifluction deposits comparing sandstone and loess.

Soil Science (General)

Agr. 143 Brammer, H. 1965. **Soil correlation boxes : A technique to simplify soil correlation.** *Pakistan J. Soil Sci. 1(2) : 21-28.*

For field correlation in particular, a method of preserving profile samples is required which is quick and simple to provide, horizon samples of adequate size which preferably can be handles for direct matching against samples of other soils, and which allows the profile samples to be carried about conveniently and safely during frequent changes of field-base. The use of the soil correlation boxes described below meets most of these requirements. This technique is being use to facilitate soil correlation on the reconnaissance soil survey of East Pakistan.

Agr. 144 Islam, M. A. 1965. **The development of Soil Science in East Pakistan.** *Pakistan J. Soil Sci. 1(2): 48-52.*

The following organisations were carrying out soil investigatory work of one kind or other in East Pakistan.

1. Soil Survey Project of Pakistan.
2. Soil Fertility Project, East Pakistan, Directorate of Agriculture.
3. Soil Conservation Scheme East Pakistan, Directorate of Agriculture,
4. Agricultural Chemistry Division, East Pakistan, Directorate of Agriculture (including Micronutrient Research Scheme and Soil Microbiology Section).
5. EPWAPDA Soil and Agricultural Survey Division.
6. Pakistan Atomic Energy Commission Agricultural Research Centre, Dacca.
7. Pakistan Jute Research Station, Soil Chemistry Division.

8. Pakistan Jute Research Institute, Soil Science Division.
9. Pakistan Sugarcane Research, Soil Chemistry Section.
10. Forest Products Research Laboratory, Chattagong.
11. Soil Science Department, Dacca University.
12. Soil Science Department, Mymensingh Agricultural University.
13. EPWAPDA Soil Mechanics Laboratory.

Agr. 145 Kari, A. Q. M. B. 1966. **Soil Science Education in Bangladesh.** *Pakistan J. Soil Sci.* 2(1) : 13-16.

If we want that our soils are to be properly managed to improve our agriculture, forestry, gardening, if we want that our soils are to be tested for the construction of a good lasting road, a well laid bridge and a permanent factory and also if we want to examine our soils for industrial use, then we need a large number of people who are educated and trained in soils at different levels of education. To achieve this end a well thought plan consisting of all the machineries higher to mentioned for the propagation of thorough knowledge, extensive man education in soil science is to be evolved. Action in this direction will definitely lead us to our long desired goal of national prosperity and happiness.

Agr. 146 Molla, Y. A. and S. A. Ahad. 1967. **A study on the effect of Jhum cultivation on some soils at varying slopes in Chittagong Hill Tracts.** *Sci. Res.* 4(4) : 189-197.

The present study on the effect of Jhum cultivation on the nutrient status of some soil at varying slopes in Chittagong Hill Tracts, although limited in its scope has endeavoured to add to the pool of knowledge a quantitative answers in ameliorating and maintaining soil fertility.

From the results of mechanical and chemical analysis of the soil it has been found that due to Jhum cultivation the clay fraction (active particles) and water holding capacity of soils were decreased and pH of soils fell towards acid side. Available phosphorus, organic carbon, available nitrogen, total exchangeable metallic cations, exchangeable calcium and available potassium in soils were decreased considerably.

In Pakistan, attempt has not been taken to study the effect of Jhum cultivation, this study may be a basis to inspire future studies in its various aspects.

Agr. 147 Islam, M. 1969. **The response of plant cover to the physiography of some soils of East Pakistan river terraces.** *Dac. Univ. Stud.* 16(B): 1-14.

Many sandy river banks and terraces in the humid tropical region of East Pakistan that are annually flooded in the inland subtend a thick natural herbaceous vegetation. The plants persists here throughout the pronounced dry season. however, in the temporarily formed sandy shoals on river beds excepting for some xeric species, such as *Ghaphalium luteoalbum*, needle-leaved *Cyperaceae*, *Gramineae* and mosses, the vegetation is scarce. On permanent

sandy banks and terraces, the occurrence and abundance of species like *Xanthium strumarium*, *Lippia nodiflora* and several species of *Polygonum* are interesting features.

Agr. 148 Brammer, H. and P. R. Hesse. 1970. **Some unsolved problems of soil science in East Pakistan.** *Pakistan J. Soil Sci.* 6(1) : 31-44.

Soil problems relating to fertility analysis, genesis and classification in East Pakistan are outlined. They include under fertility : seasonal changes in pH value and redox potential in seasonally flooded soils; effect of flood water on plant nutrition; effect of fertilizers on saline soils; alkali soils; use of iron-rich ground water for irrigation; contribution of atmospheric nitrogen, dust and salt to soil fertility; acid sulphate soils; seasonal changes in soil nutrient status; and soil variability. Under soil analysis, they include: problems in determination of particle size distribution; cation exchange properties; organic matter; and calcium carbonate. In soil genesis and classification, problems include: genesis and classification of rapidly developing young alluvial soil; classification of soils with an anthraquic epipedon; classification of terrace and old flood plain soils showing a marked increase of clay with depth but lacking destruction takes place in seasonally flooded top soils : the genesis and significance of flood coating in seasonally flooded soils; the diversity of soils developed in the homogenous Madhupur clay; and the genesis of alkali floodplain rides soils under an annual rainfall of 60 inches.

Agr. 149 Eaqub, M. and L. Pavel. 1971. **Density spectra of soil fractions as a criterion of soil profile uniformity.** *Rostlinna vyroba (Praha)* 17 (7): 723-730.

For the purpose of determining the uniformity or heterogeneity of a soil profile, which is an important prerequisite for any profile development study, a rapid test was developed. The test is based on a distribution of soil particles of a soil fraction following the specific gravity of the particles in a density-gradient heavy-liquid column. The soil fraction particles were freed of their surface coatings prior to the segregation in the liquid column. The relative amount of particles of any given specific gravity was determined by recording photographically the light scattered by the illuminated particles, which form defined zones of accumulation in the density gradient tube. The record has an appearance of a band spectrum. This "density spectrum" was measured by means of a recording densitometer. The ratios of the height of two peaks were used as a criterion of the mineralogical identity of the very fine sand fractions of soil samples from different horizons of two soil profiles. One profile was found to be heterogeneous, while the other one was reasonably uniform. The described method can be used instead of the laborious mineralogical analysis for the given purpose.

Agr. 150 Rahman, S. M. 1972. **Importance of micronutrient studies in soil-plant relationship by activation analysis- A review.** *Nuclear Sci. Appl.* 6 : 41-45.

Problems related to soil-plant relationship involving micronutrients can effectively be studied by activation analysis. This technique has already been used in the studies of micronutrients in soils and plants by a number of scientists. At present, attempts are being made in the

Atomic Energy Centre, Dacca to see whether activation analysis programme can be taken up with the existing facilities.

Agr. 151 Karim, M. and S. M. Alam, 1973. **A comparison of methods for estimating available sulphur.** *J. Ind. Soc. Nucl. Tech. Agr. and Biol.* 2(3) : 109.

A comparison of eight chemical methods for the extraction of available sulphur with A value (plant available soil sulphur as determined by isotopic technique) determined for six lateritic humid tropical rice soils, revealed that 0.5 M NaHCO₃ as an extractant was the superiod.

Soil Microbiology

Agr. 152 Chowdhury, M. S. 1966. **Some microbiological problems of East Pakistan soils.** *Pakistan J. Soil Sci.* 2(1) : 36-37.

In East Pakistan soils, there exists a number of microbiological problems which were as follows -

1. Need for research on leguminous crops and their root-nodule bacteria.
2. Control of soil-borne plant pathogens.
3. Microbiology of the paddy field.
4. Conservation of organic matter in soils. Decomposition of organic residues and their gradual disappearance from soil are largely controlled by the micro-organisms in soil.

Agr. 153 Chowdhury, M. S. and M. N. Islam. 1968. **Population densities of microflora in a paddy soil.** *proc. 20th Pakistan Sci. Conf. Abstr. A-* 10-11.

The changes in population densities of microflora in a fertile loamy soil were studied in presence and absence of fertilizers and rice plants. The abundance of the microbial populations were determined by plate-and MPN count techniques at different hydrological conditions of the soil, namely, desiccated, field capacity, submerged and dried after submergence. The kinds of microflora whose densities were determined were : total microflora, bacteria, fungi, actinomycetes, algae, nitrogen fixing algae, cellulose decomposers nitrifying bacteria (ammonia oxidisers and nitric oxidisers) and nitrate reducing organisms (Nitrate reducers or nitrate reducing nitrite formers and denitrifiers).

In general, moistening the desiccated soil to field capacity resulted in a marked increase in numbers of all the microflora excepting the denitrifying organisms which suffers a great decline in numbers. The presence of plants or fertilizers had little or no effect upon the microfloral components during the period of field capacity and 90 days submergence. Submergence of the soil caused a marked reduction in numbers of all the microflora excepting the nitrate reducing organisms. Both populations of nitrate reducers and denitrifiers were stimulated during the early period of submergence. Denitrifiers were inhibited in presence of plants during the period of submergence. Most adverse effect of submergence was apparent

on actinomycetes, nitrifying bacteria especially the nitric oxidisers, cellulose decomposers and fungi. Drying of the submerged soil caused a greater increase in numbers of all the microflora excepting nitrate reducing organisms. The stimulatory effect was most pronounced upon those which were most adversely affected by submergence.

Agr. 154 Chowdhury, M. S. and A. K. M. S. I. Khan. 1968. **Cultural characteristics of certain native strains of root-nodule bacteria East Pakistan.** *Pakistan J. Soil Sci.* 6(2): 21-29.

Forty isolates of root-nodule bacteria from seven different hosts were isolated in pure culture and their colonial, morphological and physiological characters examined. The isolates were divided into fast and slow-growers and a number of cultural traits were found correlated with the growth characteristics.

It is proposed that growth characteristics, fermentation characters, citrate utilisation, reaction in litmus milk and nitrate reduction could be used as diagnostic features in subdivision of the root-nodule bacteria.

Agr. 155 Haque, M. Z., M. Kobayashi, K. Fujii and E. Takahasai. 1969. **Seasonal changes of photosynthetic bacteria and their products.** *Soil Sci. and Plant Nutri.* 15(2):

A successive variation of eight groups of micro-organisms including photosynthetic bacteria in paddy field was studied. In the early September, the growth of both *athiorhodaceae* and *thiorhodaceae* were highest under drainage condition in middle of September, these photosynthetic bacteria decreased but nitrifiers increased rapidly.

It is specially interesting to note that even in Japan where much nitrogen fertilizers are supplied number of nitrogen fixing microorganisms were higher as compared with those non-nitrogen fixers.

The straw powder of rice plant was decomposed under various conditions by the mixed population of micro-organisms. It was found that under submerged light condition molecular nitrogen was fixed most actively and during the decomposition period the roles of photosynthetic bacteria and algae are very important.

The extraction method of nucleotides from the cells of *R. capsulatus* was studied and it was found that nucleotides including purine bases could be extracted more easily than pyrimidine bases.

Agr. 156 Hosain, A. K. M. M. and Z. H. Bhuiya. 1969. **A study on the distribution and abundance of the *Azotobacter* species in the different soil tracts of East Pakistan.** *M.Sc. (Ag.) Thesis. East Pakistan Agr. Univ. (MS)* 90 p.

The experiment was conducted with 13 soils representative of different soil tracts and sub-tracts of East Pakistan. Three methods (viz. Soil-plaque or Mudpie plate count, and Most-

Probable Number) were used. The *Azobacter* population decreases in the following order : silt loam (lower Meghna flood plain, pH 8.6), sandy clay loam (Madhupur jungle tract, pH 5.1), silty clay loam (Old Brahmaputra flood plain, pH 6.8), sandy loam (Chittagon Hill Tracts and other hilly areas, pH 5.8), sandy clay loam (Barind tract, pH 5.5), sandy clay (Chittagong coastal plain, pH 4.9). In East Pakistan soils, *Azotobacter* counts per gm. of soil (oven dry basis) estimated by MPN method vary from 126-3470 and 80-1752 at 0-6" soil depths respectively. With Plate-Count method, *Azotobacter* population per gm. of soil ranges between 114-2751 at 0-6" and 6-12" soil depths.

Agr. 157 Bhuiya, Z. H. and M. Hossain, 1971. **The most probable number and dilution plate methods for counting *Azotobacter* in soils of East Pakistan.** *Pakistan J. Forestry*. 21 (2) : 193-197.

A laboratory study was made to count the *Azotobacter* species in two methods (plate count and most probable number) with soil samples collected from the 13 different soil tracts and sub-tracts of Bangladesh at 0-6 inch and 6-12 inch depths.

The *Azotobacter* spp. are aerobic, non-symbiotic nitrogen fixing soil organisms. The study was undertaken to compare the agar plate and most probable number methods and evaluate distribution and abundance of *azotobacter* in the 13 different soil tracts and sub-tracts of East Pakistan. A large *Azotobacter* cell count has been found in most probable number method than the plate count method. The *Azotobacter* population is higher in silt loams and low in sandy clay soils of East Pakistan.

Agr. 158 Nurul Islam, A. K. M. and M. A. Uddin, 1969. **Studies on the blue-green algae of Dacca district.** *Dac. Univ. Stud.* 16(B) : 1-11.

The taxonomy, ecology, periodicity and seasonal variations of 112 species of blue-green algae under 33 genera belonging to eight families and five orders have been described from the district of Dacca, East Pakistan.

Agr. 159 Bhuiya, Z. H. 1971. **Asymbiotic nitrogen fixing bacteria-A review.** *Pakistan J. Forestry*. 21(2): 183-192.

The ultimate source of nitrogen for the construction of nitrogenous organic compounds is the atmosphere. Throughout the plant and microbial kingdoms, there is a category of species that maintains the capacity to reduce nitrogen to ammonia. These are termed "nitrogen-fixing" organisms. Such organisms included certain species of heterotrophic bacteria, both aerobic; only one chemoautotroph; photosynthetic bacteria; several algae; yeasts, and a symbiotic system, consisting of bacteria of the genus *Rhizobium* together with certain plants. principally legumes. 28 papers were reviewed.

Agr. 160 Kobayasi, M. and M. Z. Haque, 1971. **Contribution to nitrogen fixation and soil fertility by photosynthetic bacteria.** *Plant and Soil, Special Vol.* 443-456.

The nitrogen fixation ability of *Rhodopseudomonas capsulatus* (a member of the

photosynthetic bacteria) has been investigated. This organism can fix N_2 most effectively under illuminated anaerobic conditions. However, in mixed culture in symbiotic association with heterostrophic bacteria this microorganism using pyruvic acid excreted by the heterotrophs, is capable of fixing nitrogen even under an apparent aerobic environment.

It has been demonstrated that some correlation exists between the growth of photosynthetic bacteria and the reproduction of the rice plant. Compared to the mineral fertilizer, application of photosynthetic bacteria at the reproductive stage of rice plants, increased the yield of grain. This was confirmed by the fact that the root system of rice is capable of absorbing amino acids and nucleic acids excreted by photosynthetic bacteria. Uracil and proline have the most influence on rice reproduction. This is also true for tomato plants.

Many toxic molecules such as hydrogen sulphide, amines etc. are found in soil. They are metabolized by photosynthetic bacteria which contribute to the purification of polluted waste waters from industry and domestic sources etc.

Agr. 161 Shahjahan, A. K. M. and M. A. W. Mian. 1973. **Fungal populations in rice and peanut field soils.** *Bangladesh J. Bot.* 2 (1) : 27-36.

71 and 67 thousand fungal colonies/g of dry soil were isolated from the peanut field during October and July assay periods respectively. Isolation in October from the rice fields showing heavy, moderate and no infection of rice plants indicated fungal populations of 209.4, 95.8 and 92.8 thousand colonies/g of dry soil, respectively. The corresponding populations for rice fields in July were 41.8, 33.4 and 38.2 thousand colonies/g of dry soil. 123 species of fungi belonging to 43 genera and 12 unidentified species were isolated from rice and peanut field soils. High population of fungi in the soil of heavily infected rice field was due to gradual incorporation of additional substrate to the soil, by the progressively dying roots of the diseased rice plants, which enhanced the growth and sporulation of the selective soil-inhabiting and soil-invading fungi. Seasonal variation in fungal population was pronounced in the low-lying rice fields; consistently higher populations were observed during the dry season than in the wet monsoon. Almost identical levels of fungal populations were recorded from the peanut field soil, located on a high land, during both the assay periods.

Soil Mineralogy

Agr. 162 Hubibullah, A. K. M., D. J. Greenland and H. Bramer, 1971. **Clay mineralogy of some seasonally flooded soils of East Pakistan.** *J. Soil Sci.* 22 (2) : 179-190.

The clay fractions of four seasonally flooded soils from East Pakistan have been studied using X-ray, DTA, and infra-red methods, total chemical analysis, surface area determination, and electron microscopy. The soils represent young alluvium (Borda series), a juvenile ground water laterite (Nunni Series), a groundwater laterite-latosol intergrade (Noadda series), and a surface water glic (Chhiata series). Mica, kaolinite were present in all the soils, and

vermiculite in all except in Noadda. Vermiculite, total except in Noadda. Vermiculite, total magnesium content and $\text{SiO}_2/\text{Al}_2\text{O}_3$ ratio decreased and Kaolinite increased in the sequence Norda-Nummi-Noadda. Electron micrographs indicate that in the Borda (representing flooded plain), which is the youngest and subjected to the longest period of annual flooding, iron hydroxides are present as gels coating the surface of the clay mineral particles. Such coatings are less apparent in the Nunni clay, and in the Noadda clay most of the free iron oxides appear as small granules. The Chhiata soil has about 12.5 per cent of its clay fraction in the form of an amorphous gel rich in silica, and much of the mica and Vermiculite in randomly interstratified complex.

Agr. 163 Eaquad, M. and L. Pavel, 1973. **Investigations of three Czechoslovak soil profiles on the basis of genetic horizons : II. Clay mineral and heavy mineral studies.** *Rostlinna Vyroba (Prague, Czechoslovakia)* .

The quantitative estimation of the clay fraction ($2\ \mu$) and the heavy minerals in 20-50 μ fraction was performed by X-ray diffraction analysis and polarizing microscope respectively. The x-ray diffraction analysis of the clay shows that illite, kaolinite, quartz, montmorillonite and interstratified illite-montmorillonite were present in all three soil profiles. Investigation by the polarizing microscope in one of three profiles indicates that anatase and quartz were substantially present in the heavy fraction of all horizons. A number of other heavy minerals were detected as minor and accessory minerals.

Soil Organic Matter

Agr. 164 Bhuiya, Z. H. and L. R. Webber, 1963. **Note on the use of soils for the disposal of sodium wastes from canneries.** *Canadian J. Soil Sci.* 43 : 400-401.

Some fruit canneries in Southern Ontario use sodium hydroxide in the processing programme and dispose of the waste by sprinkler irrigation. This method of disposal removes, in part, the public objection to offensive odors that develop when the waste is lagooned and the organic material undergoes partial decomposition. This note reports the levels of exchangeable soil sodium that occurred when a total of 1320 pounds of sodium per acre was applied in cannery waste to a poorly drained Lincoln clay during 1858-1960 inclusive.

Agr. 165 Patwary, S.U. and A. Q. M. B. Karim. 1963. **Peat used as a soil conditioner,** *M. Sc. Thesis Dac. Univ. (MS)*.

The physical properties of soil (water holding capacity, porosity, true and apparent densities and permeability) at 4 different stages namely; immediately after mixing the soil with peat before sowing of seeds and after 5, 10, and 15 weeks from the date of sowing were found out. There were 7 treatments including check and each was replicated 4 times. Then the effect of peat on the physical properties of soil as mentioned above was examined. It was found that the application of peat increased the physical properties of soil in respect to its water holding capacity, porosity and permeability, whereas, it decreased the true and apparent densities of

the soil which was heavy in nature. This improved physical condition of the soil appreciably increased the crop (corn) yield in term of its dry matter, height and number of leaves per plant.

Agr. 166 Bashir, M., M. S. Sandhu and M. Karim. 1968. **Sugar mill waste as a source of nitrogen and organic matter**. *Nucl. Sci. Appl.* 5(A) : 22-25.

The response of rice plants to the application of sugar mill waste (press-mud) in respect of nitrogen and phosphorus uptake was evaluated.

The results suggest that press-mud may not compete with the inorganic nitrogen fertilizer for the immediate supply of nitrogen but may have residual effect on the same. Application of fully decomposed press-mud or that of unde-composed press-mud to a soil having ideal condition for quick decomposition may improve the nitrogen supply because of its reasonably high nitrogen content.

Due to its high content of phosphorus, the press-mud contributes to the plant available phosphorus and in addition, its decomposition increases the availability of sol phosphorus.

Agr. 167 Khan, F. R., C. A. Mayeenuddin and M. S. Chowdhury, 1970. **Effect of industrial waste on nitrogen mineralization in soil**. *Pakistan J. Soil Sci.* 6(2) : 25-31.

Application of industrial waste in Jalkandi soil (pH 7.1) and Chhiate soil (pH 5.6) showed that at lower doses (200 and 300 lbs/acre) there was an apparent stimulating effect on mineralization of soil nitrogen. At higher doses, industrial waste had a serious deleterious effect upto nitrification; ammonification remaining unaffected. This deleterious effect was more severe in the acid soil than in the neutral one. The azotobacter count reflected the inhibiting effect of industrial waste in both soils at all the doses.

Agr. 168 Talukder, N. M. and A. Karim, 1972. **A study of the production of combustible gas from organic wastes**. *M.Sc. (Ag.) Thesis, Bangladesh Agr. Univ. (MS)*. 59 p.

Effort to produce combustible gas out of organic refuses has been successful both in pilot and in semi-commercial scales. The design of the plant was made to suit our local condition. A family consisting of 5-6 members would require a plant of 100 cft. gas storage capacity and fulfil its fuel requirements for cooking and lighting. The size of the plant would depend upon the requirement of the gas by the consumer and hence the amount of charge to be given.

Organic wastes and water should be mixed in the ratio 1 : 1 to give charge to the plant. An inoculum of *Methanobacterium* sp. and a calcic activator would be required to initiate and accelerate the fermentation reaction. Fresh material should be fed into the fermenter every day at the rate of 1/30th of the first charge. The production of the gas depend on the quality of wastes being used. The temperature has also a direct bearing on the rate of production of the gas. The gas could also be used to burn through Bunsen burner, operating Flame-photometers,

for welding purposes, etc. Besides it would provide a highly sanitary method of their disposal and save the environment from getting polluted.

Soil Physics

Agr. 169 Ghani, M. O., K. A. Hasan and H. A. Talukder. 1966. **Effect of cowdung and water-hyacinth on the aggregation of a red soil of Dacca.** *Pakistan J. Soil Sci.* 3 (1) : 26-31.

Studies have been made on the effect of cowdung and water-hyacinth with and without CaCO_3 and CaSO_4 on aggregation permeability and non-capillary porespace of a lateritic soil of Dacca. Results show that cowdung alone does not help aggregation to any appreciable extent and water-hyacinth produces the best aggregation and a considerable improvement in the permeability and non-capillary porosity of the soil.

Agr. 170 Khan, S. H. 1968. **Influence of mechanical separates and different cropping systems on the formation of water-stable aggregates in irrigated soils.** *pjsi* 4 (1) : 24-30.

The continued use of deep-rooted legumes might produce a favourable physical condition in the soil below 6 inch depth. It is doubtful, however, the proper fertilization and proper tillage will produce the most desirable effects on the physical condition of the surface layer because of the presence of such large amounts of small size sand and particles and because heavy mechanical equipment is frequently used for cultivation, especially during periods when the soil is somewhat wet.

Agr. 171 Isris, M. 1970. **A study of soil water infiltration in olton soil.** *part of Ph. D. dissertation. Texas A and M Univ. U. S. A.*

A field study of soil water infiltrations was conducted in three 8 x 8 meter square plos in Olton soil at Lubbock, Texas. Rates of infiltration were measured after irrigating the plots. The infiltration period varied depending on initial amount of water present in each plot. The infiltration period was longer with higher initial water content. The rates of infiltrations were very fast at the beginning and continuously decreased with time until they attained a nearly constant value. The infiltration rates were lower during the second irrigation than the first because of high initial moisture content in the former case.

Agr. 172 Bhuiya, Z. H. and S. M. Shaheed, 1971. **Some physical studies on the red soils of Dacca.** *Sci. Ind.* 8 (2) : 194-199.

The red soils of the Madhupur Jungle Tract are generally known as lateritic soils. The area under present investigation lies eight miles north of Dacca and two furlongs north of the Dacca Cantonment Railway Station. The soils were collected from two locations. Fine sand is the dominant fraction in the surface samples. The soils show a low silt content are rich in clay. The surface soils have lower particle densities than the sub-soils. The bulk densities

increase with depth. The surface horizons have high total pore space and it decreases with depth.

Agr. 173 Ishaque, M. and A. H. Cornfield. 1972. **Effect of level of soil moisture on nitrogen mineralization and nitrification during incubation of Bangladesh tea soils.** *Bangladesh J. Biol. Agr. Sci.* 1 (1) : 52-58.

The effects of varying static moisture contents (20-100% maximum water holding capacity, mwhc) on levels of mineral N (NH_4^- and NO_3^- -N) during incubation at 30°C for 2, 5, and 12 weeks of low flat (LF) and high flat (HF) tea soils (pH 4.1 and 4.2) from Bangladesh were studied.

The optimum moisture content for mineral-N accumulation after 12 weeks was 40% mwhc for the LF soils and 100 mwhc for the HF soil. During 5 weeks of incubation the HF soil generally accumulated more mineral-N than did the LF soil at all moisture contents. After 12 weeks of incubation there was a little difference in mineral-N accumulation at 20-60% mwhc between the two soils, but at 80-100% mwhc accumulation was considerably higher in the HF soil. There was small nitrate accumulation in the LF soil at the lower moisture contents but only with up to 5 weeks of incubation. In the HF soil there was a fair accumulation of nitrate at all moisture contents.

Soil Reclamation.

Agr. 174 Khan, S. H. 1966. **Effect of cropping systems on certain physical properties of soil under irrigated condition.** *Pakistan J. Soil Sci.* 2 (2) : 22-30.

Cropping systems, with sweet clovers both Hubam and Madrid varieties and especially the former have definite beneficial effects on the physical conditions of this particular soil. Apparently, the root system of the clovers is such that it loosens, as well as adds organic matter to the soil at lower depths, and which generally improves the soil physical condition as a whole.

Agr. 175 Brammer, H. 1968. **Possible influences of flood protection, Drainage and irrigation on the soils of East Pakistan.** *Pakistan J. Soil Sci.* 4 (1) : 8-16.

Provision of flood protection, drainage and irrigation to the soils of East Pakistan will lead to changes in their profile morphology. Floodplain ridge soils protected from seasonal flooding are likely to benefit from increased biotic mixing which will increase porosity and structure throughout the profile and eventually lead to homogenized colours. Exposure of soils to heavy monsoon-season rainfall could lead to formation of alluvial subsoil pans, especially below silty topsoils low in organic matter. Basin soils are likely to remain seasonally flooded and be less changed than perennially drained soils, except where irrigation for boro might lead to perennial water-logging and gleying. Embankment and drainage should quickly desalinize

coastal saline soils, but may lead to acid and toxic conditions in acid sulphate soils. Drainage of peat soils could lead to disastrous shrinkage and irreversible dying out.

Except near the coast and locally in Khulna Division, irrigation sources are non-saline. Gangetic water will increase lime contents of soils on which it is used and use of iron-rich groundwater may cause nutrient imbalance for some crops. Drainage must be provided to prevent problems of water-logging and extension of presently saline areas by large-scale irrigation.

Agr. 176 Brammer, H. 1968. **Decalcification of soils developed in calcareous gangetic alluvium in East Pakistan.** *Pakistan J. Soil Sci.* 4 (2) : 8-20.

Fresh Gangetic alluvium is calcareous. Basin soils developed in this alluvium are mainly non-calcareous to a depth of 1 foot or more, but show no significant lime accumulation layer below. It is suggested that decalcification takes place under reduced conditions during seasonal flooding, calcium carbonate being transformed into more soluble bicarbonate in the presence of organic matter and lost by solution in the flood water. The different rate of decalcification in ridge and basin soils is attributed to higher contents of organic matter and more prolonged flooding of basin soils and to biotic soil mixing and mainly aerobic decomposition of organic matter in ridge soils.

On the oldest Ganges floodplain, both ridge and basin soils are decalcified in their upper layers but have a marked lime accumulation layer at a variable depth. It is conjectured that decalcification in these soils occurred under former natural grass or reed swamp conditions by the process suggested above. The lime accumulation layer is probably not derived by leaching of lime from the overlying soil but by precipitation from the groundwater a process which is apparently still active.

Agr. 177 Islam, A. and S. M. Ullah. 1968. **Reclamation of Kosh soil.** *Pakistan J. Soil Sci.* 4 (2): 45-53.

An experiment was carried out in the Green House of the Department of Soil Science, Dacca University, to study the effects of various treatments on the growth and yield of rice. Rice plants grown on amended pots tillered better, gave significantly better growth and yield due to the higher assimilation of phosphorus, calcium, magnesium, potassium, iron and manganese. Of the various amendments, the combined application of calcium carbonate and manganese dioxide produced significantly best growth and yield by bringing about favourable pH and reducing toxic levels of aluminium. While the rice plants at control condition (not leached with distilled water).

Soil Survey

Agr. 178 Rahman, M. M. and Z. H. Bhuiya. 1965. **Some physical and chemical studies on the Brahmaputra alluvium of Mymensingh (A land use survey).** *M.Sc. Ag. Thesis. East Pakistan Agr. Univ. (MS). 51 p.*

The area surveyed is known as Dhara, a village. Haluaghat of the Mymensingh district and lies in the northern part of Sylhet basin. The study shows that because of low pH, poor structural development, and poorer nutrient status, the soils of the investigation area indicate the necessity of liming, and they are quite likely to give a good response to all the three N, P, K fertilizers. The area as a whole represents a good class of land suitable for regular cultivation with a few limitations, and it can be safely cultivated with ordinary good farming methods.

Agr. 179 Brammer, H. 1967. **Soil Survey in Pakistan : How and why.** *Pakistan J. Soil Sci. 3(2): 1-15.*

Techniques are described by which soils are identified and mapped on reconnaissance and detailed surveys. The use of airphotos in soil mapping and the role of soil analysis in support of soil survey are explained.

The popular belief that the main object of soil survey is to collect soil samples for determination of their nutrient status is now out-dated. Soil survey has a much broader objective : to identify, classify and map soils for the purpose of evaluating their use capability and management needs. In this evaluation, emphasis is placed on physical soil properties examined in the field.

With information provided by soil surveys, fertilizer, irrigation and other agronomic trials can be made on known soils and their results extended to the mapped areas of these soils. This can lead to more precise recommendations being made to farmers and greater efficiency in the use of fertilizers, irrigation water, etc. Costs of soil survey are negligible relative to land development costs and expected benefits.

Agr. 180 Chakravarty, D. K. and M. A. Mannan. 1969. **A detailed survey of East Pakistan Agricultural University Farm Soils and to classify the farm lands on use-capability basis.** *M.Sc. (Ag.) Thesis. East Pakistan. Agr. Univ. (MS). 112 p.*

The present land-use is predominantly agricultural, rice, jute and pulses being the major crops which are well-adjusted with the soil potential and land features. A small portion of the marshy area is used for raising boro crop. However, the area as a whole, represents a good class of land suitable for regular cultivation with a few limitations. On the basis of topography, soil properties, limitations in use and crop performance, the soils are classified into Land Class I, Land Class II, Land Class III, Land Class II-III and Land Class III-IV.

Agricultural Extension Education

Agr. 181 Halim, A. 1968. **An analysis of training needs of the union Agricultural Assistants of my Sadar North sub-division.** *M. Sc. (Ext. Ed.) Thesis. East Pakistan Agr. Univ. (MS). 153 p.*

The major purpose of the study was to identify those training needs of the Union Agricultural Assistants by evaluating their knowledge and job-skills in the seven selected subject matter areas. Maximum training was found to be needed in programme evaluation followed by programme planning, programme execution, extension teaching methods, technical subject matter, local leadership development, and understanding extension programme. Significant relationships were found to exist between the training needs of the Union Agricultural Assistants in programme planning, programme execution, and technical subject matter and their age and tenure of service. In-service training had no influence on the training needs of the Union Agricultural Assistants while formal education had significant relationships in technical subject matter and extension teaching methods, Union Agricultural Assistants of younger age of higher formal education and of short tenure of service needed comparatively less training than others.

Agr. 182 Huque, M. M. and A. M. Anwarul Karim. 1969. **Information sources used by the IRRI rice growers of Thakurgaon Thana Co-operative Tube Well Project.** *M. Sc. (Ext. Ed.) Thesis. East Pakistan Agr. Univ. (MS). 225 p.*

Researches conducted in Bangladesh and elsewhere revealed that generally communication exposure to the client system affects positively in the diffusion of agricultural innovations. The present study was therefore undertaken to study the phenomena that were related exclusively on a particular element of the communication process, the channels of communication.

The study revealed that among the selected 10 sources, model farmer was used to the higher extent as indicated by 217 as its Source Exposure Index which was followed by weekly meeting, neighbour and relative, farm and home visit, radio, printed material, agricultural magazine, film show, office call, and newspaper. The selected 20 tube wells were also found to have been differently exposed to communication media, the maximum extent being expressed by 14.33 as Tube-Well Exposure Index and the minimum being 4.75. The investigation further revealed that on an average 2.0 exposures to information sources were cited at trial stage, 1.6 at interest stage, 1.4 at evaluation stage, and 1.0 at awareness stage. The relationship between age and use of sources was statistically insignificant. However, the relationships between size of farm, socio-economic status, and land tenure on the one hand and the use of sources on the other, were significant at different levels of probability. As regards preference of the growers for sources it has revealed that farm and home visit was preferred to the highest extent which was followed in descending order by model farmer, weekly meeting, radio, film show, neighbour and relative, printed material, agricultural magazine, office call and newspaper. The most important reasons for non-use of the sources

were non-cooperative attitude of the model farmer, irregular holding of weekly meeting, irregular visit of the farmers by the change agents, and inability of the farmers to read printed material and agricultural magazine.

Agr. 183 Hossain, M.A., A.M. Anwarul Karim and S.G. Mahboob. 1969. **Adoption of improved farm practices by the transplant aman rice growers in Gouripur Union of Mymensingh district.** *M. Sc. (Ext. Ed.) Thesis. East Pakistan Agr. Univ. (MS).*

Purpose of this study was (1) to determine the extent of adoption of four improved farm practices by the transplant aman rice growers; (2) to identify the information media through which the growers received information; and (3) to explore relationships of the adoption of four farm practices with six selected characteristics of the growers. Data were collected from 138 respondents selected at random from all the transplant aman rice growers (1383) in Gouripur union of Mymensingh district.

Sixty-seven per cent of the growers adopted plant protection measures compared to 36 per cent adopting recommended variety of paddy, 25 per cent line transplanting method and 12 per cent recommended doses of fertilizer. Farmers generally used more than one medium for receiving information about any improved farm practice. Mass contact and Agricultural agency contact were the major sources of information at the awareness stage, Agricultural agency contact and Informal contact at the interest stage, and Informal contact at both trial and adoption stages. Education, size of farm, credit availability and organizational participation had positive relationship with adoption of all the four practices. Land tenure had positive relationship with adoption of plant protection measure and line transplanting method only. Age had no relationship with adoption.

Agr. 184 Nurul Anwar, A. B. M., A. N. M. Shamsuzzoha and S. G. Mahboob. 1969. **Opinion of adults and youths for organization of youth clubs in two selected villages of south Mymensingh.** *M. Sc. (Ext. Ed.) Thesis. East Pakistan Agr. Univ. (MS).*

Purpose of the study was: (i) to have an understanding of the opinion of adults and youths for organization of youth club and (ii) to explore relationships of the selected characteristics of adults and youths with their opinion for organization of youth club. Data were collected from 100 adults and 100 youths selected at random from two villages of south Mymensingh.

Eighty-three per cent of adults were strongly willing to organize youth club. Eighty five per cent of youths were willing to participate in youth club. Youths as well as adults preferred agricultural activities in youth club to be done through collective projects. Adults preferred winter season for training in the vicinity of their village for a week. Adults, though keen on youth club, expressed inability to render financial support in this respect.

Education of adults had a positive relationship with their opinion for cooperation in youth club. Age, income, farm-size and time spent in farming of adults were not associated with their opinion for organization of youth club. Education of youths had a positive relationship

with their opinion for participation in youth club. Age and helping parents in farming of youths were not associated with their opinion.

Agr. 185 Islam, M. M., A. N. M. Shamsuzzoha and S. G. Mahboob. 1971. **Adoption of innovations in the Primary Agricultural Cooperative Societies of Comilla Kotwali Thana and its relationships with the characteristics of their leaders.** *M. Sc. (Ext. Ed.) Thesis. Bangladesh Agr. Univ. 199 p.*

The purpose of this study was to determine the adoption of three selected innovations by the Primary Agricultural Cooperative Societies of Comilla Kotwali Thana, Bangladesh and to explore relationships of the adoption with six selected characteristics of managers of the societies. The three selected innovations were new crop, tractor cultivation, and irrigation practice and the six selected characteristics were age, education, size of farm, tenure of leadership, agricultural knowledge and communication exposure of the managers.

Twenty nine per cent of the societies had high adoption of new crops, 50 per cent medium and 21 per cent low. Adoption of tractor cultivation was high in 55 per cent of the societies, medium in 43 per cent, low in 16 per cent, and nil in 16 per cent. proportions of the societies having high, medium, low, and no adoption of irrigation practice were 22, 33, 19 and 26 per cent respectively.

Age, agricultural knowledge, and communication exposure of the managers had positive relationship with the adoption of all the three innovations by their cooperative societies. Tenure of leadership had positive relationship with adoption of new crop and tractor cultivation, but not with adoption of irrigation practice.

Agr. 186 Ziaul Karim, A. S. M. and S. G. Mahboob. 1973. **Relationships of selected characteristics of transplant aman rice growers with their adoption of fertilizers in Keyotkhali Union of Mymensingh District.** *M. Sc. (Ext. Ed.) Thesis. Bangladesh Agr. Univ. (MS).*

Purpose of the study was (i) determine the extent of adoption of fertilizers by the transplant aman rice growths and (ii) to explore the relationships of the selected characteristics of the growers with their adoption of fertilizers. The characteristics included age functional literacy, land-tenure, effective farm-size, commercialization, organizational participation, cosmopolitaness, extension exposure and fatalism. Data were collected from a sample of 100 respondents selected by Stratified Random Method from all (992) the farmers of Keyotkhali Union of Mymensingh District.

Analysis of data indicated that 38 per cent of the growers used Urea alone, and 11 per cent Urea and Phosphate. Only 5 per cent of the farmers used all the three fertilizers. Even these growers did not use the fertilizers according to recommended doses. Adoption indices of Urea, Phosphate and Potash were 376, 101 and 23 respectively, while the adoption index for any fertilizer could range from 0 to 1200.

A positive relationship was observed between the adoption of fertilizers and each of the six characteristics, namely, functional literacy, effective farm-size, commercialization, organizational participation, cosmopolitanism and extension exposure. Fatalism of the farmers had a negative relationship with their adoption behaviour. Age and Land-tenure had no relationship with adoption of fertilizers.

Agr. 187 Rahman, M. M. and A. F. M. Serajul Islam, 1973. **An investigation into factors related to adoption of improved farm practices in transplant aman cultivation in two villages of Mymensingh District.** *M. Sc. (Ext. Ed.) Thesis. Bangladesh Agr. Univ. (MS). 192 p.*

The study was designed (i) to determine the extent of adoption of improved farm practices (use of fertilizer, line sowing, irrigation and insecticides) by the transplant aman growers, (ii) to identify and discuss some selected personal, socio-economic, socio-cultural and psychological characteristics namely, age, education, size of farm, social participation, modernism, cosmopolitanism, material possessions, leadership, flexibility, and rationality of the transplant aman growers, and (iii) to determine the relationship between selected characteristics of the transplant aman growers and their adoption of improved farm practices. Data for this study were collected from a sample of 100 farmers selected at random from a total population of 182 transplant aman growers in two villages (Kazirshimla and Dulalbari) of Trishal Thana.

It was revealed that use of fertilizer topped the rank order of improved farm practices followed in descending order by use of insecticides, line sowing, and irrigation to crops. The extent of adoption of different practices in combination indicated that 22 per cent of the farmers adopted all the 4 practices, 49 per cent adopted 3 practices, 22 per cent 2 practices, and 5 per cent only one practice. Categorization in respect of high, average, and low adopter category of different practices indicated that for fertilizer it was 15.7, 69.4, and 14.7 per cent; for insecticides 18.6, 54.0, and 21.9 per cent, for line sowing 20.0, 80.0, and nil per cent; for irrigation 8.0, 92.0, and nil per cent respectively.

Except age and flexibility all the selected characteristics of the transplant aman growers significantly related with their adoption of improved practices. In all cases the relationships were found to be positive.

Agr. 188 Fakir, G. A. 1972. **Problems of Agricultural Research in Bangladesh.** *proc. Seminar on Agric. Policy and Agric. Education in Bangladesh, Bangladesh Agr. Univ.*

Major problems encountered for conducting effective agricultural research in Bangladesh are—poor administrative policy, administrative anomalies, ignorance and bureaucratic attitude of the administrative authority, want of skilled and qualified research personnel, poor pay, status etc. for the research scientists, inadequate fund, inadequate number of research institutes/stations, poor laboratory and library facilities, lack of coordination and co-operation among the research organizations, universities and between research and extension, wrong

selection of research programmes, brain drain, political instability etc. The following remedial measures to overcome these problems have been suggested;

1. The present "Secretariat" should be abolished and personnel with proper agricultural background and training should only be appointed as chief executive of different agricultural organizations for better research administration and for formulation of better research policies.
2. Enough skilled and qualified research scientists should be produced.
3. Adequate number of agricultural research institutes/stations should be established.
4. Adequate financial, laboratory and library facilities should be made available.
5. Proper pay and status should be given to the agricultural scientists.
6. Well co-ordinated and integrated research should be developed.
7. Research problems should be selected on priority basis, giving more emphasis on adaptive research.

Crops

Beverage Crops (Tea and Coffee)

Cultural Practices

Agr. 189 Abbasi, F. H. and M. A. Mannan. 1961. **Preliminary studies on the effect of irrigation on the yield and vigour of tea.** *Pakistan J. Biol. Agr. Sci.*, 2 : 88-91.

Irrigation may enhance the plucking time. It maintains significantly higher yield during first two months of plucking. The application of 4" of total water was found to be better than both 1" and 2" of water per month. 4" of water applied at a time gave better results in respect of height of shoots and yield than the same quantity of water applied in splits at different time intervals.

Agr. 190 Ali, M. M. 1963. **Effect of seed size on the growth of tea seedlings.** *Tea J. Pakistan*, 1 (1) : 33-37.

In order to study the effect of size of tea seeds on the growth of the seedlings, seeds collected from ten seed reserves were divided into three grades of size namely, small, medium, and large and sown in the nursery, the layout being split plot design.

Results showed that bigger the seed better was the growth of the seedlings. Large seeds produced better seedlings than those of the other two grades. The difference in growth between the seedling of small and medium seeds was not, however, statistically significant.

Agr. 191 Hasan, K. A. 1963. **Shade trees for tea : Part I, their functions and behaviour.** *Tea J. Pakistan*. 1 (2) : 9-16.

Shade is an integral part of the normal tea husbandary. In this article stresses have been given on the selection of right type of shade tree and their proper management. Further functions and characteristics of shade trees found in the tea gardens of East Pakistan have been dealt with.

Agr. 192 Hasan, K. A. and S. H. Shaudhury. 1963. **Studies on the water requirements of tea seedlings.** *Tea J. Pakistan*. 1 (2) : 24-39.

Studies were made to determine the economic method of irrigating tea nurseries using Gypsum Blocks and Bouyucos Moisture meter. Controlled irrigation was found to be more economic than the usual procedure followed in the tea gardens.

Agr. 193 Venkataramani, K. S. 1963. **The potentialities of chemical weed control in tea fields.** *Tea J. Pakistan. 1(1) : 18-32.*

The possibilities of weed control in tea fields by chemicals have been discussed. Trials with Dalapon (2, 2-dichloropropionic acid) at Coonoor Experimental Station of United Planter's Association of South India encouraging and a fairly satisfactory control of grasses were observed. Two applications of Dalapon, each at 5.35 Kg. ha. or at 5.35 and 4, 5 Kg/ha. or at 5.35 and 3.36 Kg./ha. were reasonably effective in controlling the grass weeds. No phytotoxic symptoms of the chemical were observed on the tea bushes.

The value of seven weed killer in controlling broad leaf weeds was assessed. All the chemicals have had a good effect in the control of weeds. Cornox D and Kuron were very effective in the control of dicot weeds and Paraquat was useful against both dicot and monocot weeds. No phytotoxic symptoms was observed on the tea bushes following the application of those weed killers.

Agr. 194 Akbar, K., M. M. Ali, and N. A. Bhuiyan. 1964. **Control of weeds in tea nurseries.** *Proc. 16th Pakistan Sci. Conf. Sec. P-23.*

Borrearia sp., *Bhumea* sp., *Scopavia dulcis* and other weeds including the grasses are common in tea nurseries. Tests with weedicides were conducted to find possible substitutes for hand weeding operations which are time consuming and troublesome. Trials with Gesatop 40w (2 lbs./a.).

Premerge (1:10) and Casoran (12 lbs/a.) were conducted for post-emergence control with the first two chemicals and for pre-emergence control with all the three. Post-emergence application of Gesatop 40w (2 lbs./a.) was, therefore, found to be the best treatment and can be adopted to replace hand weeding operation. Trials with premerge at lower concentrations will be continued.

Agr. 195 Ali, M. M. and N. Ahmed. 1964. **Studies on the germination and growth of tea seedlings raised from cracked floater and sinker seeds.** *Tea J. Pakistan. 2 (2) : 25-28.*

A comparative study was made between cracked floater and sinker seeds from three different sources to ascertain the germination capacity of the seeds and the growth of the resulting seedlings.

Sinkers appeared to be significantly superior in respect of germination to floaters but no difference was observed after 52 weeks in plant height and stem diameter of the seedlings raised from them.

Agr. 196 Faizullah, M., K. A. Hasan, and N. Ahmed. 1964. **Effect of irrigation on the yield and vigour of tea.** *Tea J. Pakistan.* 2 (1) : 29-35.

The effect of irrigation on mature tea was studied for four years. Irrigation during the rainless dry spell prevalent in the tea regions of Pakistan was found necessary to counteract the loss of crop. Four inches of water applied at a time in a month appeared to be better than any lower rate or split applications.

Agr. 197 Hasan, K. A. and S. H. Chaudhury. 1964. **Relationship between soil reaction and growth of shade trees used in tea gardens. Effect of pH on the growth of *Derris robusta* Benth.** *Tea J. Pakistan.* 2 (2) : 4-10.

Investigations were made to study the effect of soil reaction for the optimum growth of *Derris robusta*, a hardy and canker resistant shade tree for tea. The study revealed that *Derris robusta* does better between soil pH 5.0 and 6.0; at pH 5.5 growth was found to be the best below pH 5.0 and 6.0 the growth deteriorates.

Agr. 198 Ali, M. M., Faizullah, and N. Ahmed. 1965. **Effect of spacing on the yield of tea.** *Tea J. Pakistan.* 3 (2) : 26-29.

Various spacings are in use in tea plantation. The present investigation stemmed from the necessity of studying the relative efficiencies of various spacings in terms of yield especially for East Pakistan.

Yield data in terms of green leaf were recorded in 1963 and 1964. In both the years tea planted at 4"x 2' 2' spacing gave the highest yield. The yield due to the treatments 4" x 2" single hedge and 5' x2½' x2½' were also significantly higher than the rest of the treatments such as 4' x4' and 5½' x4½' square and triangular.

Agr. 199 Hasan, K. A., S. H. Chaudhury, and M. A. Halim. 1965. **Effect of climatic factors on the yield of tea (*Camellia sinensis*).** *Tea J. Pakistan.* 3 (1) : 4-13.

Relationships between monthly yield of tea per acre and rainfall, mean temperature and mean range of temperature (max.-min.) have been discussed after obtaining their correlation coefficients and regression equations for six tea estates. Both rainfall and mean temperature have shown high positive correlation with yield but mean range of temperature has shown negative correlation. The multiple regression equation $y' = -3.6746 + .0301 R_f + .0591 T - .0049 R_t$ obtained can be utilized to estimate monthly yield.

Agr. 200 Akbar, K. 1967. **Control of weeds in tea estates.** *Tea J. Pakistan.* 5 (2) : 25-29.

The article contains recommended measures for the control of Mikania creeper, grasses (including sun grass) and Bagrakote weeds outside and within the tea. The details of flame cultivation and the names of approved weedicides, their doses and approximate costs per acre for first and subsequent rounds are also given.

Agr. 201 Akbar, K. 1968. **Control of the sensitive plant (*Lajjabati lata*) in old tea sections.** *Tea J. Pakistan.* 6 (2) : 14-17.

The sensitive plant, *Mimosa pudica*, is a common weed mainly of old tea sections. Because of its prickles and bristles, it seriously impedes efficient plucking. Manual control operations require large number of workers, considerable time and many repeat operations every year. Experiments with a number of weed- have now shown that Amitrol used at 4 lbs. a.i. in 40-80 gallons of water per acre with two follow up rounds effectively suppresses this weed. In subsequent years spot treatment rounds are sufficient to keep the weed in check.

Agr. 202 Ali, M. M. and H. Chakraborty. 1968. **Effect of seed size on the growth of tea seedlings.** *Tea J. Pakistan.* 6 (1) : 15-18.

To find out the effect of seed size on the growth of tea seedlings studies were made with small, medium and large seeds for three years.

Results showed that up to one year stage the bigger the seeds, the better was the growth of the seedlings. This trend, due to large seeds, was observed in all the three years though the differences were not significant. However, medium sized seeds failed to show the trend after one year of growth.

Agr. 203 Hasan, K. A., S. H. Chauthury, and M. Uddin, 1968. **Studies on the relationship between available moisture and the growth of tea plants raised from vegetative cuttings.** *Tea J. Pakistan.* 6(2) : 5-13.

Studies were made to find out the relationship between available moisture and the growth of tea plants raised from vegetative cuttings. The growth of the plant was found satisfactory at 20-30% and 40-60% available moisture levels than those maintained at 70-90% and below 20%. But at 40-60% the plants were at their best.

Agr. 204 Mollah, S. A. 1968. **Number of tea plants per acre.** *Tea J. Pakistan.* 6 (2) : 18-24.

Formula for calculation of the number of tea plants per acre for different planting systems have been worked out and are presented in this article.

Agr. 205 Ali, M. M., H. Chakra borty, and B. Alam. 1969. **Effect of leaf area on the strike and subsequent growth or tea cuttings.** *Tea J. Pakistan.* 7 (2) : 6-14.

Rooting and growth performances of tea cutting having two, one, $\frac{3}{4}$ th, $\frac{1}{2}$, and $\frac{1}{4}$ th of the mother leaf were studied with clones B. 201/39 and TV₁.

Results indicate that single leaf cuttings are the best of the treatment for propagation and that cuttings with $\frac{3}{4}$ th size of the mother leaf are also equally good as the standard single leaf cuttings especially in clone TV₁. Rootings and growth performances of TV₁ are significantly superior to B. 201/39.

Agr. 206 Chakraborty, H. and M. M. Ali. 1969. **Studies on the preservation of the shoots and cuttings of clones B. 201/39 and TV₁.** *Tea J. Pakistan.* 7(2) : 12-17.

Prepared cuttings and whole shoots can be preserved in polythene sleeves as long as 120 hours without any detrimental effect on strike.

Storage has no adverse effect on the ultimate growth of the cuttings. It was however seen that there exists clonal difference on the survivability of cuttings and that survivability of cuttings in B. 201/39 was significantly higher than TV₁.

Agr. 207 Ali, M. M. 1970. **Pruning of tea in East Pakistan.** *Tea J. Pakistan.* 8 (2) :

Crop production largely depends on timely and judicious pruning operation. This article explains the time and method of pruning and its cycle suited to the climatic condition of East Pakistan.

Agr. 208 Ali, M. M. 1970. **Observation on pruning of tea seedling in the nursery.** *Tea J. Pakistan.* 8 (1) : 14.

Nursery pruning in Ceylon is a common practice. In this short communication, the author has given his observation on nursery pruning under East Pakistan condition. The author has observed that pruning at 8" and 11" appreciably encourages the formation of desirable side branches from the lower region without any loss of vigour and growth of the seedling due to early cut as many of the planters apprehend.

Agr. 209 Chaudhury, S. H. 1970. **Replanting of tea.** *Tea J. Pakistan.* 8 (2) :

Replanting of an old tea area becomes imperative when the sections produce less than half the per acre average yield of the garden. This low yield is attributable to high percentage of vacancy, worn out soil, pest disease etc. In this article, the author has briefly described the method of rehabilitation of worn out soil and how this can be exploited to maximize the yield.

Agr. 210 Rashid, A. 1970. **A note on Trs. clone B. 201/39.** *Tea J. Pakistan.* 8 (2) :

Clone B. 201/39 is a proven standard clone with its yield potential superior to that of Indian clone TV₁. the quality characteristics also compare very favourably with TV₁. It tends to produce deep root and possess inherent tendency to become bushy.

Agr. 211 Hasan, K. A. 1971. **Modernizing the cultivation of tea in East Pakistan.** *World Crops, May-June.*

Tea occupies a very important position in the economy of Pakistan. Increasing internal consumption at the rate of about 4 million pounds every year has exceeded all expectations and it has become necessary to boost up the production. Tea Research Institute at Srimangal has been playing a part in achieving this object through extensive surveys to find new areas

for expansion of cultivation and investigations launched to improve methods of cultivation and cultural practices, and introduce high yielding and better quality plants.

Agr. 212 Hasan, K. A. 1972. **Tea research in Bangladesh.** *World Coffee and Tea*. April-May.

Bangladesh Tea Research Station started its establishment from 1957 but its real drive commenced in 1961. Achievements already made during this short span of time may be regarded as of great value to the industry. Methods to establish tea, vegetative propagation nurseries and shade trees successfully are now widely used by the tea estates with great success. Search for new, more efficient, cheaper and time saving chemicals for the control of pests and diseases of tea have born fruits. Discovery of the high yield and quality potential clone B. 201/39 may be considered as an outstanding contribution of the Research Station. The efficient and effective advisory services have already changed the attitude of the planters and they are now keen to establish the industry on sound scientific footings.

Agr. 213 Ali, M. M. and M. Faizullah, 1973. **Tea culture.** *Tea J. Bangladesh*, 9 (1) :

The requirement for raising a successful tea plantation are quite exacting in nature in addition to being different than the cultivation techniques for other field crops. The main features of tea cultivation have been briefly discussed. The recommendations made in the article are only to be used as guidelines.

Entomology and Pathology

Agr. 214 Abbasi, F. H. and K. Akbar. 1962. **Studies on the control of eelworms in tea nurseries. Effect of fumigation with Nemagon on the population of eelworms in the soil.** *Pakistan J. Biol. Agr. Sci*, 5 (1) : 6-9.

Nemagon was used experimentally at two tea estates namely Silloah and Deanston for fumigation of tea soils at doses of 2½, 5, 7½, 10, 12½ and 15 gallons/acre. The data obtained was subjected to statistical analysis. 7-8 weeks after fumigation, all the doses of the chemical brought about a high degree of reduction in the number of eelworms. About 8 months after application of treatments, 2½ and 10 gallons/acre doses behaved adversely at Silloah, otherwise the treatments gave significantly superior results over the controls. About 13 months after fumigation, the treatments didn't behave differently from the controls.

Agr. 215 Akbar, K. and S. M. Khan. 1962. **Control of tea seed bugs.** *Pakistan J. Biol. Agr. Sci.*, 5 (1) : 30-36.

So far, hand picking is the only method to control the tea seed bugs-pests of the 'seed baries'. Two trials each in the field and laboratory were conducted with organic phosphorous insecticides. Folidol M-50, Folidol E-605, Dipterex E. C. and Metasystox. The Laboratory trials were carried out to confirm the results of the field trials and to find out whether the results are significant both for treatment and time factors.

The results show that organic phosphorous insecticides achieved significant control of the tea seed bugs.

Agr. 216 Akbar, K. 1963. **Principles and practices of plant protection work with reference to tea.** *Tea J. Pakistan. 1 (2) : 17-25.*

The intensive cultivation of crops in large areas supplied unlimited opportunities to disease causing organisms and pests to multiply and perpetuate themselves. To decide on the best means to fight them, an appreciation of the factors influencing their relationship with the plant is essential. The article briefly discusses and outlines basic principles of tea protection.

Agr. 217 Khan, S. M. and K. Akbar. 1963. **Bacterial control of tea bunch caterpillars (*Andraca* sp., Family Bombycidae, Lepidoptera).** *Proc. 15th Annu. Pakistan Sci. Conf. A-12.*

Biological control of insect pests in nature is well known. It was for the first time that such a phenomenon was recorded in one of the tea estates in Juri Valley, South Sylhet, East Pakistan. Large scale death of Tea Bunch caterpillars without use of any insecticide was observed in July, 1961 and investigation was undertaken to ascertain whether it was due to any disease in the epidemic form. Bacterial serum separated from the dead caterpillars, was used to treat live Tea Bunch Caterpillars, both the direct inoculation and by providing serum smeared tea leaves as food, under laboratory condition. In either of the cases all the caterpillars were found dead within 24 hours whereas untreated specimens were still alive. The experiment was also repeated on six more different types of caterpillars with success. It was therefore concluded that the large scale death of the insects was caused by bacillus infection in the epidemic form.

Agr. 218 Akbar, K., S. M. Khan, M. A. Ali, and N. A. Bhuiyan. 1964. **Studies on the control of red spider mites of tea with some new acaricides.** *Tea J. Pakistan. 2(2) : 11-14.*

New acaricides namely Dimecron 100 (0.0%), Ekatin (0.1%), Metasystox (0.1%), Rogor 40 (0.15), and Tedion V-18 E. C. (0.2%) were used in 1962 in comparison with Lime sulphur 320 Beaume (1 part in 39 parts of water) to evaluate their comparative efficacy for the control of Red Spider mites (*Oligonychus coffcae* Nietner) on tea. 3 field trials were conducted in May, June and September. Except when rains washed off the mites, pre-treatment observations were noted once and post-treatment observations at regular intervals up to 3 months. All the acaricides yielded results significantly superior over the control. The periods for which these acaricides displayed their residual toxicity also varied.

Five laboratory trials were also conducted with Lime sulphur (1:44 dilution), Dimecron 100 (0.03%) and Tedion V-18 E. C. (0.15%) to study their homicidal action. Average percentage of unhatched eggs were 88.4 for Lime sulphur; 85.5 for Dimecron 100; 97.90 for Tedion V-18 E. C. as against 7.3 for control. Whenever hatching occurred, in the treated cases the larvae died on the spot but in the controls the larvae survived normally.

Agr. 219 Akbar, K., S. M. Khan, and M. A. Ali. 1964. **Control of Bag-worms (*Pteroma* sp.) on tea and shade trees.** *Proc. Pakistan. Annu. Sci. Conf. PA.* 54-55.

A trial was conducted with 6 insecticides, namely, Endrin 20% E. C. ($\frac{1}{2}$ and $\frac{3}{4}$ pt./a., Aldrin 20% E. C. (1 gall./a.), Dieldrin 20% E. C. ($\frac{1}{2}$ and 1 gall./a.), Metasystox (0.0%) and Finis (1 lb./40 gall. water). Observations which were noted before application of treatment and twice afterwards at fortnightly intervals showed that infestation of tea bushes continued due to dropping of Bag-worms from the trees. Both tea and shade trees were, therefore, sprayed with Texaphene 60% and Endrin 20% E. C. Both treatments achieved complete control.

Agr. 220 Akbar, K. and M. A. Ali, 1965. **Effect of fumigation with Nemagon 75% E. C. and Dowfume W-85 on the population of eelworms in the tea nursery soil and health of seedlings. Part IV : 1962 Trial.** *Tea J. Pakistan.* 3 (1) : 19-25.

Nematon 75% E. C. was used at 1.5 and 2.5 gallons per acre and Dowfume W-85 at 4, 8 and 12 gallons per acre, Cracked tea seed was sown 10-12 days after fumigation of nursery beds.

Post-fumigation observations on the eelworm count taken after 10 days to 11 months showed that from the start all the doses of both the fumigants yielded significantly superior results over the controls. Health of the seedlings also remained unimpaired.

Agr. 221 Akbar, K., N. A. Bhuiyan, and M. A. Ali, 1965. **Control of flushworms in tea.** *Tea J. Pakistan.* 3 (2) : 5-20.

Ten field trials were conducted during the year 1963-64 with different formulations of 11 insecticides to find out the control measures of flushworms infesting young tea shoots.

Observations were first noted on 3rd/4th day after spraying and thereafter at weekly intervals. Folidol (E505 & M50), Diazinon (60E & 40W), Gusathion 20 E. C., Dipterex (FL 1/90, E50, SP 80 and WP 50), Labaycid 50 E. C., Rogor 40 and Endrin 20 E. C.) gave control of the pest about a week after spraying. Four sprayings at weekly intervals with Folidol E605 & M50, Gusathion 20, Diazinon 60E, Dipterex E 50, SP 80 & WP 50 gave highly significant control of the pest up to a fortnight after 4th spray, after which the infestation again increased indicating that weekly spraying must be continued to check it.

Agr. 222 Akbar, K. and M. M. Ali. 1965. **Studies on the control of eelworms in the tea nurseries. Effect of fumigation with shell D.D. on the population of eelworms in the soil. III, 1960-61 trials.** *Tea J. Pakistan.* 3 (1) : 14-18.

Shell D. D. was used @ 30, 39, 50 and 62 gallons per acre to fumigate the tea nursery. The seed sown 3 months after fumigation germinated normally. Observations on the population of

eelworm in the soil carried out for 15 months after fumigation showed that Sheel D.D. at 30 gallons per acre was equally as efficient in controlling the eelworms as the higher doses.

Agr. 223 Akbar, K. and M. A. Ali, 1965. **Studies on the control of eelworms in the tea nurseries. Effect of fumigation with Nemagon E.C. on the population of eelworms in the soil II, 1960-61 trials.** *Pakistan J. Biol. Agr. Sci.* 8(1) : 200-253.

Nemagon 75% E. C. at doses tried significantly reduced the population of eelworms in the soil. There after, upto 15 months the population of eelworms in the treated plots remained significantly lower than the controls. Even the lowest dose (T-2, 2.2 gallons/acre) has given results from third month after fumigation onwards which are not significantly different from other higher doses of the chemical but are superior to the control.

Agr. 224 Akbar, K., M. A. Ali, and N. A. Bhuiyan. 1966. **Studies on the control of red spider mites (*Oligonychus coffeae* N.) of tea.** *Tea J. Pakistan.* 4 (1) : 12-18.

The paper contains the report on seven trials with some new acaricides for the control of eggs, nymphs and adults of red spider mites. Results showed that the chemicals tested at the given doses have yielded promising results.

Agr. 225 Akbar, K., M. A. Ali, N. A. Bhuiyan and M. I. Haq. 1966. **Studies on the control of red spider mites (*Oligonychus coffeae* N.) of tea.** *Tea J. Pakistan.* 4 (2) : 4-11.

To find out the effectiveness of different acaricides like Morocide 50, Basudin (R), Kelthane E. C., Thiodan, Ekatin, Metasystox (R), Rogor 40, Tedion V-18, Dimecron 100, Lime sulphur, Polystan, Ortho Dibrom in controlling eggs, nymphs and adult Red spider mites and for assessment of residual effects of certain acaricides, the present study was made. Significant results were obtained against nymph and adults with lime sulphur, Dimecron and Tedion, against egg with Polystan, Basudin, Morocide, Kelthane, orthodibrom, Thiodan, Eaktin, Rogor 40 and Metasystox. In tests of residual effects of acaricides to Red spider mites transferred on tea leaves 3, 7 and 15 days after treatment. Polystan, Morcoide, Basudin, Kelthane, Ortho Dibrom and Thiodan exhibited highly significant kill of nymphs and adults over control.

Agr. 226 Akbar, K. 1970. **The mode of action of pesticides.** *Tea J. Pakistan.* 8 (1) : 9-13.

Pesticides exhibit different modes of actions. They may thus act as stomach and/or contact poisons or may also possess powers of diffusion/penetration or of translocation in the tissues of the plants. Still others may be able to vaporise wholly or partially and thus be suitable for fumigation of granaries, stored food or other products, green houses, soils of action of pesticides is helpful (a) in the selection of chemicals for specific purposes and (b) choosing the correct method of their application.

In this article the author has introduced the elementary knowledge regarding different modes of actions of pesticides.

Agr. 227 Akbar, M., M. I. Haq, and M. A. Ali. 1970. **Pnk mites of tea and its control.** *proc. 21st and 22nd Pakistan. Ann. Sci. Conf. p. 20.*

The mite (*Acaphylla theae*) (Watt) Keifer) is very minute and attacks preferably the young leaves which look pale, yellow, silky and brown along the midribs. The infested bushes respond with reluctance to flush.

Morocide, Kelthane, Lime Sulphurs and Bidrin were found to be most efficient in controlling the pink mites.

Agr. 228 Ali, M. A. and M. I. Haq. 1973. **Scarlet mite of tea and its control.** *Tea J. Pakistan. 9 (1) :*

Studies were made to find out suitable chemicals to control scarlet mites in tea. The study revealed that Tedion V-18, Akar 338, Kelthane, Morocide, Dimecron 100, Ethion 4 and Perfekthion were suitable for controlling the mite.

Agr. 229 Akbar, K., M. A. Ali, and N. A. Bhuiyan. 1965. **Further studies on the control of red rust disease *Cephaleurs parasiticus* of tea.** *Proc. 17th Annu. Pakistan. Sci. Conf. PA 53-54.*

In prophylactic cum palliative trials 10 fungicides each at 2.5 lb. actual material per acre were applied. The fungicides were Perenox Cobredon, Haft vitigran blue, Cupravit-ob-21, Vitigran Conc. Blitox Copratol, Shell Copper Copramat and Cobox. In both the trials all the fungicidal treatments gave highly significant control. In two palliative trials all of the above copper fungicides except Haft Vitigran Blue were tried and gave highly significant results. Two more such trials with Kumulus (0.6%), Wepsyn (0.25% F), Tabasan (0.3% F), Pernide (0.2% F) Polyram Combi (0.2% F), Ortho Phaltan (0.3%), Dithane N45, Dithene 8-31 (each at 0.3% F) and Haft Vitigran Blue (.35% F) gave, except Dithane 8-1, significant control at 1% level. Dithane was significant in one trial only at 5% level.

Nutrition

Agr. 230 Abbasi, F. H. and M. A. Mannan. 1962. **Effect of phosphate and potash fertilizers on the yield of tea.** *Proc. 14th Pak. Sci. Conf. Sec. Agr. 39.*

An investigation was therefore initiated in one of the Tea Estates in Sylhet to study the effect of Potash and Phosphate fertilizers on the yield of tea. Nine different treatments of P and K (including control) each of which was replicated three times were included in the experiment. 40 lbs. N per acre, being the basic dose, was included in all the treatments. The treatments were as follows : P = 0, 40 and 80 lbs. per acre and K = 0, 40 and 80 lbs. per acre. Results obtained during 1959 showed that the treatment having 80 lbs. P and 80 lbs. K per acre gave 21% higher yield than the control. Fertilizers were applied for the second time in early 1960

and yield data was collected throughout the season. On analysis of 1960 results it was revealed that the same treatment (80 lbs. P and 80 lbs K per acre) of 8960 results it was revealed that the same treatment (80 lbs. P and 80 lbs. K per acre) produced 18% higher yield than control. The second highest crop was produced by the plots with 40 lbs. P and 80 lbs. K per acre. Here the crop was found to be 18% higher in 1959 and 11% higher in 1960 than the control plots.

Agr. 231 Abbasi, F. H. and M. A. Mannan. 1962. **A study of the comparative effect of urea and ammonium sulphate as sources of nitrogen on the yield of tea.** *Proc. 14th Annu. Sci. Conf. Agr. 39.*

To study the relative efficiencies of urea and sulphate of ammonia as sources of nitrogen an experiment was started in one of the tea estates in Sylhet East Pakistan.

Seven different treatments included in the experiment are as follows : control, 40, 80 and 120 lbs. N per acre from urea and 40, 80 and 120 lbs. N per acre from urea and 40, 80 and 120 lbs. N per acre from sulphate of ammonia.

The experiments were replicated four times. Data collected during the year 1960 showed that plots having 80 lbs. N per acre from sulphate of ammonia gave 40% higher yield than the control plots and 22% higher than the plots with either 80 lbs. or 120 lbs. N per acre from urea. Results obtained during the year 1961 showed that plots with 80 lbs. N per acre from sulphate of ammonia produced 36% higher yield than the control plots and 15% higher yield than the plots having equivalent quantity of N per acre from urea.

Agr. 232 Mannan, M. A. 1962. **Effect of single and split applications of NPK mixtures on the growth of tea seedlings.** *Proc. 14th Pak. Sci. Conf. Agr. 40.*

NPK mixture in the ration of 1 : 2 : 2 keeping N at 2 lbs. per acre is generally used for nursery seedlings. The NPK mixture used in the experiment was prepared in the ratio of 1 : 2 : 2 keeping N = 24 lbs. to be applied per acre in the stock mixture. There were four treatments as follows : 1 = single application, 2 = two split doses applied at 3 months interval, 3 = three split doses applied at 2 months interval and 4 = four split doses applied at 1½ months interval. Thus, all the treatments covered a period of six months. The treatments were replicated three times. on statistical analysis of the results obtained it was found that single application of fertilizers gave significantly better results than split applications both in respect of height and food length of the seedlings.

Agr. 233 Hasan, K. A., S. H. Chaudhury, and A. Habib. 1963. **Seasonal variation of ammoniacal and nitrate nitrogen due to the application of sulphate of ammonia and urea in tea soil.** *Proc. 15th Annu. Pak. Sci. Conf. Agr. 21.*

To study the seasonal variation of ammoniacal and nitrate nitrogen in the soil due to sulphate of ammonia and urea treatments, an experiment was carried out in the mature tea (about 11

years old) section of Pakistan Tea Research Station Farm. Treatments included are no manure, sulphate of ammonia, urea singly, sulphate of ammonia in combination with urea each three levels of 40 lbs., 80 lbs. and 120 lbs. N per acre, urea at the rate of 80 lbs. N in combination with 48.5, 97 and 145.5 lbs. of sulphur separately per acre. The data after statistical analysis showed that : In respect of release of ammoniacal nitrogen sulphate of ammonia (40 lbs. N) is superior to urea and its combination with sulphur. In respect of release of nitrate nitrogen no significant difference was found. There is positive correlation between ammoniacal nitrogen and nitrate nitrogen at different time intervals. Maximum release of ammoniacal nitrogen was found at an interval of 105 days (month of July). The maximum release was obtained by a gradual increase in the total release of ammoniacal nitrogen and then a gradual fall till the last day of observation.

Agr. 234 Chaudhury, S. H. and K. A. Hasan. 1964. **Effect of various doses and kinds of fertilizers applied to mature tea on the changes of soil properties.** *Proc. 16th Annu. Pak. Sci. Conf. Agr.* 49-50.

To study the soil organic matter and nitrogen status of mature tea under continuous cropping and varying doses of phosphate and potassic fertilizer application (N being constant), an experiment was commenced in October, 1958 in one of the tea Estates in Sylhet, East Pakistan. Treatments were superphosphate and Muriate of Potash each at 0, 40, and 80 lbs. levels of P and K per acre respectively with the basic dose of sulphate of ammonia at 40 lbs. nitrogen per acre which was applied annually. The lay out was a randomised block design with three replications. The plot size being 32' x 32'. Soil samples from each of the plots at two depth (0.9" and 9-18") were collected before and after 3rd application of fertilizers and analysed for organic carbon and total nitrogen. The data showed that : Surface soil had significantly greater amount of organic matter and nitrogen than the subsoil before fertilizer was applied. Continuous application of fertilizers (for three years) did not bring about any significant increase in organic matter and nitrogen status of surface and subsoil.

Agr. 235 Chaudhury, S. H. 1964. **Way use fertilizers.** *Tea J. Pakistan.* 2 (1) : 13-21. The article explains why and how the fertilizers help in maintaining the soil fertility and increase crop returns. Among other points, it also gives the meaning of 1 : 2 : 2 ratio of NPK and how to prepare this mixture correctly for use in the nurseries and young tea.

Agr. 236 Chaudhury, S. H. 1964. **Soil rehabilitation.** *Tea J. Pakistan.* 2 (2) : 22-32. The article aims at impressing the need of rehabilitating the tea soils before replanting, which is often essential to restore the plant nutrients and to ensure satisfactory growth of tea. The period of rehabilitation depends on the fertility status of the land, which can be ascertained by testing soil samples.

Agr. 237 Hasan, K. A. and S. H. Chaudhury, 1964. **Effect of different forms of nitrogenous fertilizers and sulphur on the composition of tea leaf.** *Proc. 16th Annu. Pakistan Sci. Conf. Agr.* 53-54.

To study the variation in tea leaf composition when nitrogen is applied either as sulphate of ammonia or Urea and Sulphur in combination with Urea, leaf samples were analysed from the plots of a field trial experiment in which sulphate of ammonia and Urea singly and in combination were applied so as to provide nitrogen at 40, 80, 120 lbs./acre and Urea to provide 80 lbs. N/acre in combination with sulphur at 48.5, 97 and 145.5 lbs. Leaf samples were collected at fifteen days interval and leaf from similarly treated plots were mixed together and representative samples were analysed. All the treatments increased the nitrogen content of the leaf over that of the control. But the increase due to the application of sulphate of ammonia in combination with urea at 80 and 120 lbs. N/acre in proportion half and half were statistically significant. Phosphate content of the leaf from the plots which received 120 lbs. N/acre as sulphate of ammonia and urea in combination was higher. Potash content of the leaf is higher in treatments with urea alone at 120 lbs. Nitrogen and urea at 80 lbs. N/acre together with sulphur at 97 and 145.5 lbs./acre respectively. In respect of calcium and magnesium, the treatments had no effect.

Agr. 238 Faizullah, M. N. Ahmed, and K. A. Hasan. 1965. **Effect of PNK on young tea.** *Proc. 17th Annu. Pakistan Sci. Conf.* 25.

The treatments had a pronounced effect on the plant growth measured in terms of yield of green leaf. Nitrogen when applied at the rate of 40 pounds to an acre gave the highest yield, which was highly significant (at 0.1% level). But the effects of P and K as well as the interactions of N, P and K were all insignificant.

Agr. 239 Faizullah, M., K. A. Hasan and M. M. Ali. 1966. **Effect of NPK of young tea.** *Tea J. Pakistan.* 4 (2) : 18-26.

Study has been made for four years with NPK fertilizer in different doses to see its effect on young tea increasing the yield and vigour of the plants.

Results indicate that both 40 lbs. and 80 lbs. N/acre. gave significantly higher yield than no nitrogen upto 4 years age. From 5th year increase of yield due to 80 lbs, N/a. was significant over 40 lbs. N/a. Phosphate and potash requirements of young tea do not appear to be very definite.

Agr. 240 Hasan, K. A. and S. H. Chaudhury. 1967. **Relationship between soil reaction and growth of shade trees used in tea gardens. Effect of liming and pH on the growth of *Albizia odoratissima*.** *Tea J. Pakistan.* 5 (1) : 4-10.

The effect of liming and pH on the growth of *Albizia odoratissima* shade seedling were studied for two years. The *Albizia odoratissima* grows better at soil pH between 5.0 and 6.0, being best at 5.5 and it deteriorates below 5.0 and above 6.0.

Agr. 241 Chaudhury, S. H., K. A. Hasan, and A. Karim. 1968. **Formative effect of trace element zinc and the growth of tea plants.** *Tea J. Pakistan.* 6 (1) : 5-10.

The study establishes that either zinc deficiency in the soil or impeded translocation of the element in the plants responsible for poor flush or closing down the flush of tea during growing season, even though the soils are otherwise fertile and that the malady may be corrected by application of zinc sulphate at the rate depending on the condition of the bushes.

Agr. 242 Hasan, K. A. and S. H. Chaudhury. 1968. **Effect of liming and pH on the growth of *Albizzia lebbek* Shade tree.** *Proc. 20th Annu. Pakistan Sci. Conf. Sce. Agr.* 49-50.

A sandy loam soil having pH value of 5.0 was collected, dried and processed. The pH value was lowered to 4.0 and 4.5 by adding dilute sulphuric acid and raised to 5.5, 6.0 and 6.5 by adding finely powdered calcium carbonate. The treated soil samples were placed in polythene sleeves. Each treatment was replicated three times. After germination only one seed of *A. lebbek* was allowed to grow.

Observations were noted thrice after 19th, 23rd and 29th week. The growth of *Albizzia lebbek* was found satisfactory between pH 5.0 and 6.0 but at pH 5.5 the seedlings were at their best.

Agr. 243 Chaudhury, S.H., K. A. Hasan, and M. Molla. 1969. **Effect of green manuring crops on the availability of soil phosphorous.** *Tea J. Bangladesh.* 7 (1) : 9-11.

Studies on the availability of phosphorous from *Bogamedeloa*, *Crotalaria*, *Dhaincha* and *priotropis* green crops showed that after the first month *priotropis* release significantly higher amount of phosphorous over *Crotalaria* and *Dhaincha* but thereafter the differences amongst them became insignificant.

Agr. 244 Rahman, M. A., M. M. Ali, S. A. Molla, and K. A. Hasan. 1969. **Effect of artificial shade and manure on raising of shade tree seedlings.** *Tea J. Pakistan.* 7 (1) : 18-22.

Studies indicate that it is possible to raise healthy seedlings of the shade tree species *Albizzia moluccana*, *Albizzia odoratissima* and *Albizzia chinensis* without artificial shade. Also soil mixed with 20% well rotted cowdung decidedly proved better medium for producing healthy seedlings than no cowdung or 10% cowdung. The effect of manure was independent of the species and shade.

Agr. 245 Hasan, K. A. and S. H. Chaudhury. 1973. **Studies on the comparative efficacy of sulphate of ammonia and urea on the yield of tea.** *Tea J. Bangladesh.* 9 (1) : January.

The conventional source of nitrogen for tea is Sulphate of Ammonia. In view of the fact that sulphate of ammonia is procured from abroad. It became pertinent to find out efficacy of urea as a source of nitrogenous fertilizer for tea which is manufactured in Bangladesh. Six years result indicate that sulphate of ammonia is more efficient compared to urea as a source of nitrogen for tea.

Physiology

Agr. 246 Ahmed, N., M. M. Ali. 1965. **Effect of certain growth regulating substances on the growth of cuttings.** *Proc. 17th Annu. Pakistan Sci. Conf. Sec. Agr. 18.*

An experiment was conducted to determine the effects of certain growth regulating substances on rooting of tea cuttings. The treatments were as follows : 1 = Seradix B-3, Stem was smeared with the powder by cotton and planted immediately. 2 = Phyomone solution (1 gm. in 5600 c.c. of water). Base of the cutting was dipped in solution for 16 hours. 3 = Gibberellic acid (100 ppm solution). Base of the cutting was dipped for 16 hours. 4 = Urea (0.3% solution). Base of the cutting was dipped in solution for 16 hours. 5 = Control (water). Cutting were dipped for 16 hours. Observations on rooting were recorded after 29 weeks of growth. 100% rooting was observed due to seradix B-3 as against 91.6% for rest. Further observations at the age of 44 weeks on height of shoot, length of root and total dry weight were recorded. No significant difference was observed due to the treatments.

Agr. 247 Ahmed, N., H. Chaudhury, and K. A. Hasan. 1965. **Effect of Gibberellic acid on the growth of tea seedlings.** *Tea J. Pakistan. 3 (2) : 38-46.*

Tea seedlings of 6 months old were grown in polythene house. Plants were exposed to the naturally prevailing photo-periods. A randomised complete block was used with 3 treatments (control, 50 ppm GA and 100 ppm GA). Gibberellic acid was applied on foliage by microdrop method at 1 week interval for ten weeks.

Results indicate that at both concentrations, gibberellic acid was effective in stimulating stem elongation. The average increase in height per week for 100 ppm GA, 50 ppm GA and control were 6.85 cm, 4.09 cm. and 1.23 cm. respectively which were found to be significantly different from one another. However, no significant difference was found in respect of number of leaves between the treated and untreated plants.

Anatomical study indicates that the effect of gibberellic acid on stem elongation of tea seedlings is partly due to enhanced cell division activity and partly to an activation of cell elongation.

Miscellaneous

Agr. 248 Hasan, K. A. and S. H. Chaudhury. 1961. **Studies on the physical and chemical properties of old tea soils.** *Pakistan J. Biol. Agr. Sci. 2 (1) : 84-87.*

Under Sylhet conditions, failure or poor growth of tea due to under acid reaction or due to excess of lime in the soil is not generally expected. Deficiencies in nitrogen and organic matter along with unsatisfactory drainage in some cases are probably the main causes for poor growth and/or failure of tea in the replanted areas.

Agr. 249 Hasan, K. A., S. H. Chaudhury, and A. A. Khandker. 1962. **Studies on the possibilities of tea plantation in the northern zone of East Pakistan.** *Pakistan J. Biol. Agr. Sci.* 5 (1) : 37-45.

Studies have been made on the suitability or otherwise of an area known as Goalgach under P. S. Tetulia in Dinajpur, East Pakistan for tea cultivation. Although texture, acidity, lime, magnesia, nitrogen and organic matter contents of the soils are within satisfactory range, drainage of the area was found unsatisfactory for tea cultivation.

Agr. 250 Ahmed, N. 1963. **What is tea ?** *Tea J. Pakistan.* 1 (1) : 38-43.

Tea liquor contains four chemical substances. Viz, inorganic salts, caffeine, gummy matters and non-nitrogenous substance. It is concluded by chemists that it is the last group of substances which contributes materially to the liquoring qualities of tea. Briskness, strength, pungency and bright colour appear to be due wholly to theaflavins and thearubigins which are oxidised polyphenol.

Tea is made from the leaf of a plant which is botanically known as *Camellia sinensis* (L) O Kuntze. Its allied species are *C. taliensis* and *C. irrawadiensis*. Recognised infraspecific categories of *C. sinensis* are Assam, China and Cambodian types.

Agr. 251 Ahmed, N. 1963. **Improving the tea plants in Pakistan. Part 1.** *Tea J. Pakistan.* 1 (2) : 26-33.

A brief account is given on the historical background of cultivation of tea in Pakistan. The classification of tea by different workers is followed by a presentation of author's attempt to distinguish the tea population of East Pakistan into seven eco- and genocategories, viz. Manipuri, Burma, Large-leaved Assam, China, Hybrid I, II and III. Reference has also been made to the important role played by selection, vegetative propagation and line breeding leading to the clonal source of seeds in the improvement of tea.

Agr. 252 Hasan, K. A. 1963. **Soil acidity and its effect on plant growth with particular reference to tea.** *Tea J. Pakistan.* 1 (1) : 10-17.

Considering the importance of soil acidity on the growth and vigour of tea plants attempts have been made here to define "acids" and to explain the term "pH" which is used to express the degree of acidity of a system in simple layman's language avoiding all cumbersome technical words. Further to bring home to the readers the full implication of soil acidity on tea culture, nature of soil acidity, mechanism of its development and its effect on the growth of plants in general and tea in particular have been discussed in detail. Finally the pH range for the optimum growth of tea has been dealt with.

Agr. 253 Hasan, K.A., S. H. Chaudhury and A. Habib. 1963. **Possibilities of tea cultivation in Chittagong Hill Tracts-soil properties.** *Pakistan J. Biol. Agr. Sci.* 6 (2) : 93-101.

Both physical and chemical properties of the soil of Lamku (neighbourhood of Ramgarh Subdivisional town), hillocks around Selbukka Dak Bungalow on Chittagong Rangamati road, hillocks on the left hand side of Chandraghona Uda road (Rangamati sub-division) and hillocks in the neighbourhood of Khagracharri Dak Bungalow (Ramgarh Sub-division) are found suitable for tea.

Agr. 254 Ahmed, N. 1964. **Improving the tea plants in Pakistan. Part II.** *Tea J. Pakistan.* 2 (1) : 22-28.

Good clones can increase yield or quality, or both factors together. The problem is how to select tea bushes from the population growing in the tea area of East Pakistan from which to raise such clones. To date, selection for quality and strength is relatively more efficient than that for yield. Improved method of clonal selection is described here. It is suggested that the selection for quality is more effective, when it is made on the basis of lighter coloured flushing leaf and pubescence. Bushes having excellent vigour, high density of plucking points and phloem index ranging from 70 to 120 could be selected for improved yield.

Agr. 255 Hasan, K. A., S. A. Chaudhury, and A. Habib, 1964. **Tea cultivation in West Pakistan Soil properties and other environmental factors of Buffa and Tukki tea experimental farms.** *Pakistan J. Sci.* 16 (6) : 321-324.

The soil properties, climatic conditions and irrigation water have been studied. The soil is less acidic in reaction and climate is extreme for tea. Irrigation water contains high proportion of lime and therefore is unsuitable for irrigation for tea.

Agr. 256 Hasan, K. A., S. H. Chaudhury, and A. Karim. 1964. **Possibilities of tea cultivation in the northern part of Mymensingh district. Study of soil properties.** *Pakistan J. Biol. Agr. Sci.* 7(1) : 115-117.

Texturally the soils are either sand clay loam or clay loam but most of the soil belong to the sandy clay loam group. Chemical properties such as organic matter and nitrogen contents vary from 38.3 to 31.1% and 0.92 to 0.64% of the nonsandy part of the soil. The pH values vary from 6.00 to 4.52, calcium and magnesium oxides from 0.14 to 0.09% and 0.26 to 0.12% respectively. Phosphoric acid is fair but potash is low. From the point of view of soil properties the area under reference may be regarded as second grade one for tea cultivation. and 5' x 2½' single hedge. This trend indicates that the higher the density of population per unit area the higher is the yield at the early stage of growth.

Agr. 257 Chaudhury, S. H. and K. A. Hasan. 1964. **Studies on sampling technique.** *Pakistan J. Biol. Agr. Sci.* 7 (2) : 164-167.

The results showed no significant difference between augur borings and opening pits and between the number of borings-1, 2, 4 and 6. Since augur boring is easier and quicker, a single augur is easier and quicker, a single augur boring from a small experimental plot (24' x 8") to be adopted.

Agr. 258 Ahmed, N. and H. Chakraborty. 1965. **Viability of pollen grains in tea flower.** *Tea J. Pakistan.* 3 (2) : 21-26.

The present observations were undertaken with a view to obtaining information regarding the viability and germination of pollen grains of flowers from three different types of tea plants, namely China, Manipuri and Assam, under normal breeding procedure.

Results indicate that pollen grains from the China plant had longer viability and also higher germination percent than those from Assam and Manipuri plants. Maximum germination percents were 73.68, 37.50 and 29.20 in the China, Assam and Manipuri plants respectively. In all three kinds of plants, germination percent of pollen grains was found to be maximum at the first 20 minutes of their storage and thereafter a decline in viability was noticed with the advance of time. The minimum level of viability (below 5%) was recorded in both Assam and Manipuri plants after 1 hour and 45 minutes of storage. But in the China plant the level was reached after 4 hours and 15 minutes.

Agr. 259 Chakraborty, H. and N. Ahmed. 1965. **Studies on the viability of pollen grains of Bogamedeloa (*Tephrosia candida*).** *Proc. 17th Annu. Pakistan Sci. Conf. Sec. Agr.* 23-24.

Results indicate that the pollen grains have the maximum viability at the first 30 minutes of their storage and thereafter a decline in viability was noticed with the advance of time. Maximum germination percent was 80.55. The minimum level of viability (below 5%) was recorded after 5 hours of storage.

Agr. 260 Hasan, K. A. and S. H. Chaudhury, 1965. **Possibilities of tea extension in untapped areas of south Sylhet.** *Tea J. Pakistan.* 3 (2) : 27-37.

The soil properties and field conditions of certain hitherto untapped areas of Luskurpur and Balisera tea districts of South Sylhet have been investigated with reference to tea cultivation. The areas have a mixed topography. The tillahs are of varying height and valleys in between the tillahs have an undulating landscape. In general the soils are loose, friable and well drained and rich in organic matter and nitrogen. Thus the physical and chemical properties of the soils are favourable for tea plantation.

Agr. 261 Hasan, K. A., M. Faizullah, and N. Ahmed, 1965. **Rehabilitation of 3-year old nursery site.** *Proc. 17th Annu. Pakistan Sci. Conf. Sec. Agr. 20.*

Ten tons of cowdung together with 12 fortnightly applications of NPK mixture produced the best seedlings in all respects. This treatment, however, failed to produce any significant effect on plant height and stem diameter. But the effect was significant on the total dry weight (sundry) of the plants and the top-root ratio. It would thus appear possible to establish nursery on a 3-year old nursery site with proper manuring.

Agr. 262 Ahmed, N., H. Chakraborty, and M. M. Ali, 1966. **Effect of storage on the viability of pollen grains. *Camellia sinensis* L. (O), Kuntze at $44^0 \pm 2^0\text{F}$.** *Tea J. Pakistan. 4(1) : 5-11.*

The present experiment was initiated in November, 1964 to determine the duration of viability of pollen grains of tea flower at low temperature. The Pollen grains of the three agrotypes China, Manipuri and Rajghar were collected separately in clean petridishes from freshly blossomed flowers. Viability of pollens was tested and then they were kept at $44^0 \pm 2^0\text{F}$. Viability of pollen grains was examined by putting them in 10% sugar solution at every week after storing. Results indicate that viability of pollen grains gradually decreased in all samples from the day of storage. Percentage of viability came down to below 5% level in 11th week in Manipuri plants, 13th week in Assam and 15th week in China plants.

Agr. 263 Ahmed, N. and H. Chakraborty, 1966. **Studies on phloem index in *Camella sinensis* (L) O Kuntze.** *Proc. Agr. Symp. 13, 14 : 15-19.*

Variability of phloem index within and between five agrotypes of tea-China, Manipuri, Burma, hybrid complex and Rajghar was studied. Phloem index varied very highly from agrotypes to agrotypes and was significant at 1% level. It was also found that the leaves of the peripheral and central branches did not have any difference in their P.I. Seasonal variation of the phloem index was prominent in four agrotypes (with exception of Manipuri type) in September-October than in July seasons and were significant at 5% level.

Agr. 264 Chaudhury, S. H., K. A. Hasan, and M. A. Mannan. 1966. **Studies on the mineralization of nitrogen from soil incubated with sulphate of ammonia and urea singly and in combination and urea in combination with sulphur.** *Agr. Symp. Atomic Energy Centre. Dacca. 13, 14 : 9-94.*

The results obtained showed that the conversion of nitrogen into ammoniacal and nitrate nitrogen per week from urea was higher than sulphate of ammonia, urea + sulphur, and also sulphate of ammonia + urea. That is the mineralization of urea was faster than sulphate of ammonia, and its own combination with sulphate of ammonia and sulphur.

Agr. 265 Chaudhury, S. H., K. A. Hasan and A. Karim. 1966. **Studies on the effect of urea and sulphate of ammonia on soil properties.** *Tea J. Pakistan.* 4 (2) : 2-7.

Studies were made on the comparative effect of sulphate of ammonia and urea on soil exchangeable cations, base exchange capacity and soil reaction under laboratory condition. It reveals that sulphate of ammonia releases more basic-ions namely, calcium, magnesium and potassium than those released by urea. The pH values of the soil samples leached with sulphate of ammonia decrease slightly while urea increases the pH values.

Agr. 266 Hasan, K. A. and S. H. Chaudhury. 1966. **Problems of East Pakistan tea soil.** *Pakistan J. Soil Sci. II (I) : 31-36.*

There are 3 types of tea soils in Pakistan : Tillah, High flats and Beels. Texturally and chemically all of them can support good tea. Tillah lands suffer from erosion, high flats from water logging and beel soils from rapid exhaustion of the organic matter and nitrogen. This last problem is of course common to the other 2 soils also. Methods to combat these problems have been discussed. While all the 3 types of soils may support good tea, an analysis of the soils must precede the opening of a virgin land or replanting an area as the soils even though virgin may already be deteriorated and may not be worth the investment of money, time and labour.

Agr. 267 Akbar, K., M. A. Ali and N. A. Bhuiyan. 1967. **Studies on defoliation of tea.** *Tea J. Pakistan.* 5 (1) : 11-22.

Different doses of Aero cyanamid, copper sulphate (mixed with salt at 1:4) white arsenic (mixed with caustic soda at 1:1) and Reglone were applied to compare their effectiveness, in defoliating the tea bushes, their harmlessness in allowing normal bud break, growth of new shoots, yield of tea etc. with no treatment (i.e. control) and with hand defoliation treatments. Yield of crop were insignificant indicating that during the growing season treatment effects of all the chemicals were no worse as compared to control and hand defoliation treatments. Hand defoliation treatment yielded early and extensive bud break and was superior to all the chemical treatments; amongst the latter, Aerocyanamid at 500 lbs. was the best and closes to hand defoliation treatment in efficiency in all respects.

Agr. 268 Ali, M. M. 1967. **Vegetative propagation of tea in ceylon.** *Tea J. Pakistan.* 5 (2) : 16-24.

This article contains the observations of the author on vegetative propagation of tea in Ceylon. Ceylon is well advanced in the field of vegetative propagation of tea. Selection of some golden clones of 2020 series, opened a new era in the history of Ceylon tea industry which has made it possible to increase per acre yield to over 5,000 lbs. of made tea in the low country and over 2,500 lbs. in area of higher elevations compared to the average of 850 lbs. from seedling tea. Yield is taken to be the first criterion for selection clones in Ceylon; but in our country since the quality is poor both quality and yield in that order should receive equal

attention. Propagation technique in Ceylon is more or less same as practised in Pakistan. Thumb nailing of 6-8 months old cuttings in the nursery is generally practised to encourage branches from lower regions. TRI also recommends pegging down of the branches instead of customary decentering after planting out in the field.

Agr. 269 Hasan, K. A. 1967. **Factors affecting the production of tea in Pakistan.** *Tea J. Pakistan.* 5 (2) : 5-15.

The article begins with an introduction of the important part the tea plays in our national economy, points out the major reasons for poor performance of our tea estates, outlines the measures adopted by the Tea Board to correct the situation and discusses the factor affecting the production of tea under various headings such as requirements of climate, soil, genetical material, manuring, shade trees and control of diseases, insects mites and weed pests.

Agr. 270 Akbar, K. 1968. **Notes on pesticide formulations.** *Tea J. Pakistan.* 6 (1) : 11-14.

It is not realised by many people that the chemicals used for the pests and disease control are often simultaneously marketed in different formulations (e.g. as powders, granules, liquids, fumigants etc.) and also any of these formulations may be produced at different strengths of its toxic principle. Therefore, costs of different formulations and their doses for application also vary. This article contains necessary information on these aspects of pesticides.

Agr. 171 Ali, M. M. 1968. **Management of tea estate in ceylon.** *Tea J. Pakistan.* 6 (1): 19-32.

In this article, the author has given an account of his experience in the management of tea estate in Ceylon. Soil, climate and hilly nature of the country having varied elevations, are very conducive for cultivation of tea in Ceylon. Cultivation practices are based on scientific principles. The layout of an estate is made carefully keeping provision for easy access to all area of the plantation. Tea is planted in contour system. TRI recommends thumb nailing of nursery plants and bending over shoots in the field instead of customary decentering. It has obtained increased yields by using more fertilizers in split doses. But in Pakistan no appreciable increase in yield has yet been noticed with the above treatment. TRI now also recommends removal of shade from the plantations of mid and up country areas as yield was found to deteriorate under shade whereas, in our country shade is indispensable for protection of plants from drought. Most of the garden labourers are more or less same as in Pakistan. Check rolls (cultivation registers) and other relevant records maintained by the management of Ceylon tea estates cover all required information and a clear picture of useful information.

Agr. 272 Chaudhury, S. H., K. A. Hasan, and M. Molla. 1969. **Studies on the effect of different levels of phosphatic fertilizer on the growth of Bogamedeloa Tephrosia candida and Crotalaria (Crotalaria anagyroides).** *Tea J. Pakistan.* 7 (1) : 5-8.

Studies on the fertilizer requirements for the optimum growth of Bogamedeloa and Crotalaria green crops revealed crops revealed that superphosphate applications were very much useful

for their growth. The best results were obtained when triple superphosphate was applied at the rate of 75 lbs. phosphoric acid (P_2O_5) per acre.

Agr. 273 Chaudhury, S. H. and G. Kibria. 1970. **Studies on the comparative efficacy of sulphur, sulphuric acid, ammonium sulphate and aluminium sulphate in reducing soil pH.** *Tea J. Pakistan.* 8 (1) : 5-8.

Studies were made on the comparative efficacy of sulphur, sulphuric acid, ammonium sulphate and aluminium sulphate in increasing the soil acidity over a period of 30 days. Although the effect of sulphuric acid in increasing soil acidity was more pronounced immediately after application but in the long run sulphur was found more effective. Sulphuric acid also was more drastic in reducing organic carbon, nitrogen and available phosphorus contents of the soil than any of the other materials.

Coffee

Agr. 274 Ahmad, K. and A. S. Mollah, 1973. **A study on the performance of some varieties of coffee in Bangladesh.** *Bangladesh. Hort.* 1 (2) :

Eight varieties of coffee, namely, Bourbon Omaralis, Bourbon Satradoris, catuna Rajo, Lobos, Mondo Nova, Palong, Sumatra and Typica, were tried at Dacca Farm. All the varieties grew, flowered and were fruitful. While Mondo Nova was found to be the tallest; Buorbon Satradoris, Sumatra and Typica followed it closely. The stoutest trunks were formed by Mondo Nova and Bourbon Satradoris. Typica was the bushiest of all. In respect of the horizontal spread of the aerial parts, Mondo Nova was the most spreading one followed by Buorbon Satradoris, Sumatra and Palong. While the main flowering took place in the first week of March, there was a second flowering between 10th and 11th April. The varieties differed very little in respect of the time of flowering. Mondo Nova was the earliest of all to ripen, followed by Lobos, Sumatra and Bourbon Satradoris. Typica ripened last of all. Mondo Nova was the top most producer of coffee having yielded 11-14 lbs. of fresh cherry per plant. This was followed by Typica which yielded 9.43 of fresh cherry. Others produced much less quantity of cherry, Sumatra and Bourbon Omealis being the poorest of all. Mondo Nova and Typica have been recommended for Bangladesh.

FIBRE CROPS

Jute

Breeding

Agr. 275 Mia, M. M. and S. M. Ali. 1965. **Effect of gamma radiation on jute : morphological variations in the first generation plants.** *Proc. 17th Annu. Pakistan Sci. Conf. Abs. Sec. Agr. A-16.*

The objective of the experiment was to assess the effect of gamma-rays on jute and to establish the critical dose for future mutation breeding. The present report includes only the morphological variations observed at different doses in the 1st generation plants. Jute seeds from the two commercial varieties, D-154 of *Corchorus capsularis* and C. G. of *Corchorus olitorius* were irradiated with gamma-rays from 13,000 curie Co⁶⁰. Doses used were 70Kr., 90Kr., and 100Kr. The result shows that gross morphological variations occurred due to radiation.

Agr. 276 Mia, M. M. and S. M. Ali. 1965. **Radiation induced transformation of petals into leaves.** *Proc. 17th Annu. Pakistan Sci. Conf. Abs. Sec. Agr. A-16-17.*

Sparrow and Pond (1956) summarized some cytogenetic and morphogenetic effects of ionizing radiation on plants on the basis of researches carried out at the Brookhaven National Laboratory. Observations made on the effect of gamma irradiation on jute coincide with most of the findings reported so far. Many different types of morphological abnormalities have been observed on the first generation plants grown out of gamma irradiated seeds from Co⁶⁰. Aberrations produced in flowers, stems and leaves are reported elsewhere. One of the most extreme and interesting abnormality observed in this study is the transformation of the flower petals into apparently full-fledged leaves. There were five leaves in the flowers exactly at the places of petals and in the same order of arrangement. This is in addition to many of the theories advanced so far to prove that flower is modified shoot.

Agr. 277 Mia, M. M. and A. Q. Shaikh, 1965. **Interspecific hybridization in jute.** *Bull. AECD/ AG/12, Atomic Energy Centre, Dacca (MS)*

Although numerous attempts have been made during the last four decades, no hybrids combining the qualities of the two most important jute species have been released so far. Gamma-rays were used in this hybridization programme. Dry seeds of *C. olitorius* Var. C. G. and *C. capsularis* D-154 were irradiated with gamma-rays of various intensities from 70 Kr. to 100 Kr. and sown in the field. Abnormal plants showing chimerical variegation in their leaves due to radiation effect, were chosen as parents and 300 crosses of all combinations were made. Fruits were set in only 120 crosses.

Seeds of these pods were sown in pots in 1965, only 62 seeds from the D-154 x C. G. crosses and 87 seeds from C. G. x D-154 crosses germinated. All the F₁ plants from the C. G. x D-154 crosses were hybrid looking upto 10-15 leaf stage and about 30 plants of this group persisted the hybrid character upto maturity. Leaves of these hybrid plants were found to exhibit the same kind of variegation and deformity as was in the male parent of the previous generation removing any doubt about their hybrid nature.

The apparently hybrid plants attained a greater height in general than the control. Pollen fertility test revealed that about 20% of the pollen were sterile whereas sterility percentage in control plants was about 2% only. Cytological analysis of the hybrid looking plants are in progress. Unexpectedly high amount of fertility creeps the mind of the authors with doubt about the true nature of the plants. However, further study in the subsequent generations will reveal the true picture.

Agr. 278 Mia, M. M., S. M. Ali and A. Q. Shaikh, 1966. **Mutation types in the irradiated population of jute.** *Bull. AECD/AG/14, Atomic Energy Centre, Dacca (MS)*

Dry healthy seeds of the two commercial species of Jute *C. capsularis*, var. D-154 and *C. olitorius* var. C. G. were irradiated with gamma rays of varied intensities ranging from 70 Kr. to 100 Kr. Both M₁ and M₂ generations were studied in the years 1964 and 1965. M₁ variants were mostly chimeric. Some of them died at the early stage of growth but many survived to maturity. In M₂ generation changed types apparently induced mutations were produced. There were plants with (a) Flat stem having tuft of leaves (fertile), (b) Dwarf plants otherwise normal, flowered very early (fertile). (c) Various other stem and leaves abnormalities which were sterile.

Agr. 279 Mia, M. M., S. M. Ali, and A. Q. Shaikh. 1966. **The use of gamma radiation in jute breeding.** *Nucl. Sci. Appl. 2 (1) : 13-17.*

Dry seeds of *C. capsularis* var. D-154 and *C. olitorius* var. C. G. were irradiated with different dosages of gamma rays ranging from 70 Kr. to 100 Kr.

Tests from germination percentage, seedling height and survival percentage revealed that *C. olitorius* was more sensitive towards radiation than *C. capsularis*. It seems that a dose between 90 to 100 Kr is the critical dose for mutation research in jute.

In the M₁ generation different morphological changes in the leaves and stems, variation in the chlorophyll contents in the leaves and the time to flowering were also noted. In some cases it was found that the flower petals were transformed into apparently full-fledged leaves. Most of the abnormal looking plants were completely sterile. Some were fertile but their progeny did not inherit the parental characters. In the M₂ generation dwarf, early and late flowering types were isolated. They were completely fertile.

A hybrid of the cross C. G. (0 Kr.) x D-154 (80 Kr.) was obtained. These hybrids inherited the bilobed and crinkled leaf characters of the parental male plants. In the meiotic studies on the plants raised from the gamma treated seeds, different kinds of chromosomal aberrations were observed.

Agr. 280 Rahman, M. A. 1967. **Studies on the agronomical and morphological characters of some of the new strains of *Corchorus olitorius***. M.Sc. (Ag.) Thesis, Bangladesh Agr. Univ. (MS). 100 p.

Seven newly developed strains and 5 recommended varieties of *C. olitorius* were studied under field and pot conditions and at different times of the season for their agronomical and morphological characters. Late maturing plants were taller in height and better in yield. The strains Agro/F and Agro/G were very tolerant to some of the soil born diseases. The strains Agro/A, Agro/B, Agro/D had narrow leaves; Agro/C/E/G/F had broad leaves. The fruits of Agro/G were larger. The seed of Agro/D/E were green; that of Agro/A/B/C/G/ were grey and that of Agro/F was brown. The seed of O-4 was greenish grey.

Agr. 281 Eunus, A. M. and M. A. Salam, 1968. **Inheritance of quantitative characters and epistasis in jute**. Proc. 20th Annu. Pakistan Sci. Conf. Abs. Sec. Biol. p. C-20.

Inheritance of plant height and earliness (as measured from sowing to heading) in two crosses of *Corchorus olitorius* varieties was studied along with the detection and estimation of epistasis present in them. Heritability was found to be low for plant height and earliness (as measured from sowing to heading) in two crosses *Corchorus olitorius* L. For plant height overdominance and partial dominance were found in O-753 X Desimasua and O-753 X O-6 E; partial dominance was detected for earliness in both the crosses. Genetic advance in F₂ over F₃ means under selection suggested in segregating progenies for both the characters.

Detection and estimation of epistasis indicate that in the cross, O-753 X Desimasua, epistasis was due to additive X dominance effects for both the characters. In O-753 X O-6E, epistasis was partly due to additive X dominance effects and partly due to all three types of non-allelic interactions for plant height.

Agr. 282 Eunus, A. M. 1968. **Epistasis in the inheritance of earliness in a six-parent diallel cross of jute**. Proc. 17th Annu. Pakistan Sci. Conf. Abs. Sec. : Biol. p. C-20.

F₂ data collected from a six-parent diallel cross for the study of inheritance of earliness in *Corchorus olitorius*, have been analysed by following the diallel techniques of Hayman (1954) while epistasis was detected and estimated by following methods of Hayman (1957) and by utilising both F₁ and F₂ data of the same diallel cross. Varieties, G-6E and R-26 exhibited dominance while Desimasua, wild jute and O-5 showed recessiveness. On an overall basis earliness in jute was found to be controlled by both dominant and recessive genes. Six groups of dominant genes conditioning earliness were indicated. Transgressive segregation was suggested in array 4 where Desimasua is the recurrent parent. Epistasis was

detected to be widespread in the inheritance of earliness of jute. It was mostly of complementary type. Epistasis was suggested to have contribution in conditioning heterosis.

Agr. 283 Joarder, O. I. and A. M. Eunus. 1968. **Inheritance of earliness and plant height in a six-parent diallel cross of *Corchorus olitorius***. *Proc. 20th Annu. Pakistan Sci. Conf. Abs. Sec. Biol. pp. C-21-22*.

F₁ data collected from a six-parent diallel cross for the study of the inheritance of earliness and plant height in *C. olitorius*, have been analysed by following the diallel techniques of Hayman (1954). The variety O-6E exhibited presence of excess of dominant genes while the varieties R-26 and Chinese *olitorius* showed excess of recessive genes for the character earliness. On the other hand the variety Desimasua exhibited presence of excess of recessive genes and the varieties wild jute and O-5 showed a small excess of dominant genes for the character plant height. On an overall basis, earliness and plant height were found to be controlled by both dominant and recessive genes, the contribution of the former being the greater in case of earliness and that of the latter being greater in case of plant height. Eleven dominant factors have been detected to condition plant height while only one dominant factor is involved to control earliness. Transgressive segregation for the character earliness has been indicated in the arrays 5 and 3, where R-26 and Chinese *olitorius* are respectively the recurrent parents. Heritability was calculated to be 61 per cent and 29 per cent respectively for earliness and plant height.

Agr. 284 Kabir, M. Q., A. C. Biswas and Q. A. Ahmed. 1968. **Differential response of a few improved and local varieties as well as hybrid line jute to stem-rot (*Macrophomina phaseolina*) disease**. *Proc. 20th Annu. Pakistan Sci. Conf. Abs. Sec. Biol. p. 49-50*.

Seven improved varieties evolved by Jute Research Institute and three local and two hybrid lines were tried for field resistance against stem-rot disease. Two of the local varieties, Lalsachi and Rangamati wild were rated as resistant, showing 6.60 and 28.47 per cent affected plants. The other local variety CBS showed as high as 96.22% affected plants. Among the improved varieties C-3 showed 88.2% affected plants. Six other improved varieties such as C-1, C-2, C-3, C-4, C-5, C-6 and D-154 showed affected plants from 30.58 to 50.15 per cent. It was further observed that due to high susceptibility the yield with C-3, and improved variety was reduced to 13.02 maunds per acre from 29.38 maunds per acre obtained in a Sub-Station, in absence of disease. The yield with CBS due to its high susceptibility to the disease was reduced to 2.41 maunds per acre.

Agr. 285 Munshi, A. M., J. U. Sardar and A. M. Eunus. 1968. **Inheritance of plant height and earliness of *Corchorus olitorius***. *Proc. 20th Annu. Pakistan Sci. Conf. Abs. Sec. Biol. C-21*.

Inheritance of earliness and plant height was studied in four varietal crosses of *Corchorus olitorius*. One to two effective factors were detected to differentiate the two parents of the crosses for the character earliness while only one effective factor was detected for the

character, plant height. Heritability for plant height and earliness was estimated respectively to be 9.73, 26.03, 13.00 and 17.00 per cent and 25.06, 16.24, 22.00 and 29.00 per cent for the crosses C. G. X Desimasua, C. G. X O-6E, respectively. Transgressive segregation has been demonstrated for lateness in C. G. X Desimasua, Desimasua X 0632, and both for early and late flowering in C. G. X. Desimasua and 0-632 X 0-6E, while it has been indicated for taller plant in C. G. X Desimasua and C. G, X 0-6E and for shorter plant in Desimasua X 0-632. Presence of overdominance was detected in C. G. X 0-6E and Desimasua X 0-632 while partial dominance was indicated in C. G. X Desimasua, 0-632 X 0-6E for both the characters.

Agr. 286 Rahman, M., A. M. Eunus. 1968. **Inheritance of fibre-yield in a twelve-parent diallel cross of *Corchorus olitorius***. 20th Pakistan Sci. Conf. Abs. Sec. Biol. C-24.

Data collected from F₁ plans of a twelve-parent diallel cross for the study in inheritance of fibre-yield in *Corchorus olitorius* L. have been analysed by following the diallel techniques. The varieties C. G., 0-753, R-26, wild *olitorius* Assam and *olitorius* Coombator exhibited the presence of excess of dominant genes whereas the varieties O-632, O-6E and Chinese *olitorius* showed the presence of excess recessive genes. Nine to eleven dominant effective factors were found to condition the character. The heritability was estimated to be only 7-8 per cent.

Agr. 287 Rahman, M. A. and A. M. Eunus. 1968. **Inheritance of earliness and plant height in a twelve-parent diallel cross of upland jute**. Proc. 20th Pakistan Sci. Conf. Abs. Sec. Biol. p. C-22-23.

F₁ data collected from a 12-parent diallel cross for the study of the inheritance of earliness and plant height in *Corchorus olitorius* L., have been analysed by following the diallel techniques. For the character earliness, C. G., O-5, Desimasua, O-753, Chinese *olitorius* and R-26 exhibited presence of excess of recessive genes, whereas varieties, O-632, O-6E, wild *olitorius* Assam and *olitorius* Coombator showed excess of dominant genes. For plant height, varieties O-632, O-6E, Wild *olitorius* Assam, *olitorius* Coombator and Chittagong wild jute exhibited presence of excess dominant genes, whereas C. G., O-753, O-5, Desimasua and R-26 showed presence of excess recessive genes.

On an overall basis, earliness and plant height were found to be controlled by both dominant and recessive genes, while the contribution of dominant and recessive genes were in equal proportion for plant height, the contribution of dominant genes were more for earliness. Five dominant factors were detected to control earliness, whereas eighteen and twenty one dominant factors were involved to condition plant height. Transgressive segregation has been indicated for earliness in the arrays 2, 3, 6 and 8 where C. G., O-753, Chinese *olitorius* and R-26 are respectively recurrent parents and for plant height in the array 9, where Wild jute is the recurrent parent. Heritability was calculated to be 53-66 per cent and 21-35 per cent respectively for earliness and plant height.

Agr. 288 Mia, M. M. and A. Q. Shaikh, 1970. **Gamma radiation and interspecific hybridization in jute (*Corchorus capsularis* L. and *C. olitorius* L.)** *Euphytica* 16 : 61-68.

Although numerous attempts have been made during the last five decades, no hybrids combining the qualities of the two commercially most important species have been released so far. Dry seeds of *Corchorus capsularis* L. var. D-154 and *Corchorus olitorius* L. varv. C. G. were irradiated with gamma rays of various intensities from 70 Kr. to 100 Kr. and were sown in the field. Abnormal plants of the first generation showing bilobed and crinkled characters in their leaves induced by gamma rays were chosen as male parents. 300 crosses of different combinations were made. In all 120 fruits developed into maturity. All the seeds failed to germinate except those from the crosses C. G. (O Kr.) x D-154 (80 Kr.) and D-154 (O Kr.) x C. G. (70 Kr.). F₁ plants from the cross C. G. (O Kr.) x D-154 (80 Kr.) inherited the bilobed character of the male parent whereas the plants from the other cross failed to show any sign of inheritance of the male parent. This indicated that the plants from the cross C. G. (O Kr.) x D-154 (80 Kr.) were hybrids. These hybrids attained a greater height than the controls were highly fertile.

Agr. 189 Ahmed, H. U. and A. K. M. Shahjahan, 1971. **Varietal reactions of the mutants of jute and their mother variety to stem rot disease (*Macrophomina phaseoli*) (Mauhl Ashby).** *Nucleus*, 8(4) : 113-116.

Seven mutants with their mother variety D-154 of *Corchorus capsularis* were tested for their reactions to *Macrophomina phaseoli* (Mauhl) Ashby, the causal organism of stem rot of jute. Mutant C-36 was found resistant, while C-30, C-38, M-22, and C. Seg. 28 were moderately resistant. The mother variety D-154 and the mutant G. P. were moderately susceptible, whereas mutant C. Early-7 was found susceptible.

Agr. 290 Haque, A. and A. N. Ahmad, 1972. **Observations on the chromosomes of some *Corchorus* species.** *Bangladesh J. Bot.* 1 (1 & 2) : 185-198.

The morphology of chromosomes in the six diploid species of the genus *Corchorus*, namely, *C. capsularis*, *C. olitorius*, *C. trilocularis*, *C. fascicularis*, *C. aestuans*, *C. pseudo-olitorius*, showed that there are some differences in their karyotypes. Further, the chromosome complex in the tetraploid species *C. siliquosus* did not represent an exact doubling of chromosomes of any of the six diploid species investigated in the present work. The chromosomes in 'resting nuclei' of all the seven species gave the indication of being heterochromatic. Meiosis was regular in the two commercial species *C. olitorius* and *C. capsularis*. The PMCS showed predominantly a single nucleolus at pachytene stage. Only in rare cases two nucleoli were observed in a single PMC during its resting stage. At pachytene barring a few rare cases only a single bivalent was seen attached to the nucleolus although both species contain two pairs of the nucleolar chromosomes. This was also true of diplotene and diakinesis. A very interesting and rare feature observed during meiosis was the presence of "pachytene-gradient" in both the species. The chiasma frequency per cell and per bivalent was found to be higher in *C.*

capsularis and *C. olitorius*. However, the terminalization of chiasmata was found to be higher in *C. olitorius* as compared to *C. capsularis*.

Agr. 291 Islam, A. S., S. Nawaz and M. Haque, 1973. **Origin of spontaneous amphidiploid in the F₃ progeny of the cross, *Corchorus olitorius* x *C. depressus*.** *Bangladesh J. Bot.* 2 (1) : 41-45.

Early flowering in the "Tossa" variety of jute as a result of untimely sowing the of *Corchorus olitorius* is done as soon as there is rain, whether in late March, early or mid April) drastically cuts down yield of the jute fibres. In order to maintain the same level of yield in the earlier sowing of "Tosa" variety, crossing was made between the cultivar and the photoneutral species, *C. depressus*. In the F₃, five among a population of 26 showed photoneutrality and these together with the siblings (raised through cuttings) were used as male parent in the crosses with *C. olitorius* with a view to combining the qualities of yield, fibre quality and photoneutrality. The results of the small segregating population suggest that the photoneutrality is controlled by more than one pair of genes; in addition there may be a modifier complex to alter the clear cut Mendelian ratio. Meiotic study showed that the chromosomes were still sticky and of the five photoneutral F₃s at least two were tetraploid.

Agr. 292 Rahim, M. A. and M. M. Mia, 1973. **A study on the genetics of earliness in jute (*C. olitorius* L. and *C. capsularis* L.).** *M.Sc. (Ag.) Thesis, Bangladesh Agr. Univ. (MS).* 42 p.

The research work was undertaken to study the genetics of earliness in two jute crosses having a common parent in each of the species, *C. olitorius* L. and *C. capsularis* L. with an object of supplying genetic information for an effective breeding programme of evolving high yielding varieties combined with earliness. In addition, data on plant height were taken to study if there was any correlation between plant height and days to first flowering. The experiment was conducted at the Atomic Energy Centre, Dacca, in 1970.

Mean values and distribution that the time of first flowering and plant height was controlled by more than one pair of genes. Lateness was completely dominant over earliness in all crosses. The study of correlation in *C. olitorius* L. indicated that in both the crosses positive correlation between plant height and first flowering date were recorded in F₁ populations. Dominance of tallness over dwarfness and hybrid vigour for plants were observed in all the crosses in both the species.

Cultural Practices

Agr. 293 Ali, M. K. and M. Shahidulla, 1961. **Dates of sowing cum methods of planting on the growth and fibre yield of *Capsularis* jute plants.** *Proc. 13th Pakistan Sci. Conf. Abs. Sec. Agr.* A-82.

A factorial experiment was laid out in the field to study the effect of 5 different spacings (1'x3" single plant per hill, 1'x3" double plant, 1'x6" single plant, 1'x6" double plant, and broadcast) and 5 dates of sowing (April-4, April 18, May-5, May-19, and June-1) on the plant height base diameter, and fibre yield of D-154 plants. pH and BD, were recorded at the time

of flowering. The plots (10x10') were harvested at the full-flowering stage for fibre yield. The height and thickness of plants as affected by the different dates of sowing showed that the height decreased from 7.1 ft to 5.1 ft. and the base diameter from 18.3 mm. to 11.7 mm. as the sowing time was delayed from April-4 to June-1. The thickness of plants as affected by the different methods of planting showed the thinnest plants in the 1'x3" double plant system and the thickest ones in the 1'x6" single plant plots. Wider space in the 1'x6" single plants method encouraged branching of plants which is not at all desirable for fibre production. Very little difference in height was marked between plants of different spacings.

Agr. 294 Ali, M. K. 1961. **Effect of time of sowing on the flowering of jute plants.** *13th Pakistan Sci. Conf. Abs. Sec. Agr. A-81-82.*

Plants of *C. capsularis* and *C. olitorius* were grown in pots under 9 different dates of sowing, viz. February-16, March-15, March-31, April-17, May-1, June-15, and July-9, in order to study their effects on the vegetative growing period of plants. Two recommended varieties, D-154, (*C. capsularis*) and C. G. (*C. olitorius*) were used as experimental materials. The period of growth was calculated from the date of emergence of a seedling to the date of flowering.

The data revealed that C. G. plants grown at Dacca Farm between the Middle of February and the end of March flowered on June-25, that is after 40 to 55 days of vegetative growth; whereas those planted normally on April-17, flowered on August-25 and 126 days of growth. The period of growth was shortened from 126 to 90 days as the sowing time was delayed from April-17 to June-3 and from 90 days to 63 days if sowing was delayed upto July-9. However, D-154 plants did not show premature blooming if planted in the middle of March, but flowered prematurely after 65 days of growth when grown in the middle of February. D-154 plants grown between the period March-15 and April-17 flowered normally in August after 137 to 111 days of growth. Late sowing from May-1 to July-9 caused the plants to flower within 101 to 69 days. Normal time of sowing is, therefore, very important for getting proper growth and thereby optimum fibre yield of jute plants.

Agr. 295 Ali, M. K. 1962. **Time of sowing and stage of harvest on the growth and fibre yield of jute plants (*C. capsularis*).** *Proc. 14th Pakistan Sci. Conf. Abs. Sec. Agr. A-13-14.*

Depending on the topography of land and pre-monsoon rainfall capsularis varieties are usually grown between the middle of February and the end of April and harvested at either early flowering or at full-pod stage. To find out the effect of time of sowing and stage of harvest on the growth and yield of fibre five monthly plantings were done from February 15 according to a split plot design with four replications. As the plant grew it was harvested at pre-bud, bud, average flowering, and full-pod stages and measured as to height, thickness, green weight, and dry fibre weight. The results revealed that capsularis plants grown of February 15 attained maturity within 97 days of growth, whereas those planted on March 15 and April 15 required 181 days and 160 days respectively Vegetative growing period gradually shortened as the sowing time advanced further from April 15. Plant height, base

diameter, green weight, and dry fibre weight sharply increased from February 15 to April 15 planting and suddenly decreased in May and June plantings. On the average the yield was 22.23 maunds in April sown crop, while only 4.81 mds. in February, 16.90 mds. in March, 7.67 mds. in May, 4.33 mds. in June crop were recorded. Irrespective of dates of sowing, plants harvested at early bud stage yielded lowest and those harvested at full-pod stage the highest amount of fibre. The yield of fibre corresponded fairly well with the height and thickness of plants. In that plants at bud stage were shortest and thinnest but tallest and thickest plants were obtained at full-pod stage. The conventional method of harvesting jute plant at 50% flowering stage required further study. Considering both the factors together it may be said that for getting a good fibre yield early or late sown capsularis crop should be harvested at full-pod stage. However, plants grown in April showed no difference in yield between different stages of harvest.

Agr. 296 Ali, M. K. and M. Shahidullah, 1964. **Effect of data of sowing cum method of planting on the growth and fibre yield of jute.** *Pakistan J. Sci. Res.* 16 (3): 146-150.

In order to get better growth of plants and higher yield of fibre from *C. capsularis*, the crop should not be sown later than the middle of April. A spacing of 1 foot between rows and 3 inches between plants with two plants per hill appeared to be superior to broadcast or other methods of planting, but since this needs further investigation under various soil and climatic conditions, any recommendation for growers at this stage is premature.

Agr. 297 Rahman, M. F. 1969. **A comparative study of improved and country methods of jute cultivation adopted by the farmers of a village in East Pakistan.** *M.Sc. (Ag.) Thesis, East Pakistan Agr. Univ. (MS).* 109 p.

An experiment and the field trials of Pakistan Central Jute Committee and the Department of Agriculture showed that the adoption of the recommended practices could increase the per acre yield of jute fibre and income of the farmers substantially. The yield of jute could be increased 45% as the practice recommended by the Central Jute Committee. Improved method was to some extent reduced due to extension teaching programme. The adoption of recommended practices reduced the per unit cost of production by 23%. The income of the growers through improved method of cultivation increased by 47%.

Agr. 298 Gani, M. O. and A. L. Mian. 1971. **Effect of time of planting on the yield of jute seed.** *M.Sc.(Ag.) Thesis, Bangladesh Agr. Univ. (MS).* 68 p.

An experiment was conducted at the Agronomy Field Laboratory of the Bangladesh Agril. University Farm, Mymensingh during the period from April 1969 to May 1970 to study the effect of 8 different dates of planting of *Corchorus capsularis* and *C. olitorius* species of jute. The delay planting decreased the height of the plants of both the species. The number of fruits/plant was significantly influenced by the date of planting in *C. capsularis*. The seed yield of both the species were significantly influenced by the date of planting. Planting in June produced the highest yield of both the varieties of jute.

Agr. 299 Ahmed, G. and A. K. M. F. Kabir. 1966. **Studies on the biology and ecology of jute stem weevil, *Apion corchori* Marshall in East Pakistan and laboratory tests on certain insecticides against adults.** *M.Sc. (Ag.) Thesis, East Pakistan Agr. Univ. (MS).* 76 p.

Damage of jute was caused by the larvae of *A. corchori* forming knot in the fibre and black stain inside the stick. The larvae also attacked top shoots causing the production of side branches which is undesirable both from qualitative and quantitative point of view. Nodal region was the point of *Apion* attack. Application of phosphatic fertilizers increased *Apion* attack, nitrogenous and potassic fertilizers decreased the same. *Capsularis* was more susceptible to *Apion* than *olitorius*. Intensity of infestation increased from the first week of July reached the peak in first fortnight of August and then declined reaching the minimum in the 2nd week of September. Six generations were found in jute season. The only known alternate host was 'Bon-okon' *Triumfletta rhomboidea* Jucy.

Agr. 300 Alam, M. S. and A. K. M. F. Kabir. 1967. **Studies on the behaviour and population ecology of jute stem weevil, *Apion corchori* Marshall.** *M.Sc. (Ag.) Thesis, East Pakistan Agr. Univ. (MS).* 50 p.

Apion population was gradually decreased with increase of temperature during off jute season, and the weevils remained inactive during winter season. Weevil population gradually increased from May to July in jute season. Sex-ratio was found to be 0.554 : 0.448 indicating an excess of males over females. Weevil could survive from 1 to 4 days during jute and 7 to 23 days during off-jute season. Maximum number of attack was recorded when plants were 6'6" tall. *C. capsularis* was more susceptible to weevil attack than *C. olitorius*.

Agr. 301 Hossain, Q. T. and A. K. M. F. Kabir. 1967. **Studies on the extent of damage caused by jute stem weevil, *Apion corchori* Marshall and its chemical control.** *M.Sc. (Ag.) Thesis. East Pakistan Agr. Univ. (MS).* 59 p.

Survey of *Apion* infestation at different localities at the time of harvest showed *capsularis* infestation ranging from 91.74% to 98.78%. Grading of infested and non-infested fibre samples obtained from the same sources also showed that infested fibres were definitely of inferior quality. Insecticides such as Lindane (0.02% EC), Roxin (0.08% EC) and Bidrin (0.037% EC) were effective against the pest in field conditions. Granular formulations of Diazinon and Solvirex did not give significant results at the rate of 20 to 40 lbs./acre.

Agr. 302 Khan, S. A. and A. K. M. Fazlul Kabir. 1968. **Bioassay of some insecticides for the control of different instars of jute hairy caterpillar, *Diacrisia obliqua* Wlk.** *Proc. 20th Pakistan Sci. Conf. Abs. Sec. Biol. p. C-41.*

The jute hairy caterpillar, *Diacrisia obliqua* Wlk., is a serious pest of jute in East Pakistan. It feeds on jute leaves and causes damage to the crop from April to August. The larval life is punctuated by five to six instars and the life cycle is completed in 30-35 days. Ten modern insecticides were tested against different instars of the caterpillars so as to determine their

effectiveness. The second instar larvae were found to be more susceptible than the subsequent instars. The relative toxicities of the insecticides tested were found to be in the order of Bidrin, Diazinon, Thiodan, Nexion, Lindane, DDT and Sevin. Dimecron, Malathion and Roxion were found to be less toxic to this pest compared with the remaining insecticides tested. The LD₉₀ values of Bidrin, Diasinon, Thiodan and Nexion under field condition were found to be 0.059%, 0.061%, 0.05% and 0.072% respectively.

Agr.303 Siddique, A.B. and A. K. M. F. Kabir.1968. **Studies on the biology of jute mite *Hemitarsonemus latus* (Banks) Ewing.** M.Sc.(Ag.)Thesis. East Pakistan Agr.Univ. (MS).67 p.

Initial infestation of *Hemitarsonemus latus* (Banks) Ewing occurred in early June when the plants were 2' tall. Population reached peak during the last week of June or beginning of July and decreased to a great extent after heavy rainfall. Eggs of mite were whitish and laid singly on the ventral surface of the leaves. Protonymphal and deutonymphal stages were found in only female mites. Deutonymphal female mated with the adult male. There were about 29 generations during the jute season.

Agr. 304 Serajuddin, M. and A. K. M. F. Kabir. 1968. **Some biological effects of gamma rays on the immature stage of jute hairy caterpillar, *Diacrisia obliqua* Walker.** M.Sc. (Ag.) Thesis. East Pakistan Agr. Univ. (MS). 92 p.

The immature stages (egg, larva and pupa) of jute hairy Caterpillar, *D. obliqua* were exposed to various doses of gamma radiation. Their subsequent effects showed that the eggs were more radiosensitive than other stages. Resistance of larvae to radiation increased with the aging of the larva. The fifth instar larvae were more resistant to radiation than the third instar and the later stage more so than the first instar. The irradiated first and third instar larvae showed a reduction in size and weight as compared to the non-irradiated larvae. But no such variation was observed in the fifth instar larvae. The pupae transformed from the irradiated larvae showed partial to complete absence of wing pads, and there was no emergence of adults from these abnormal pupae. The male and female moths had been successfully made sterile by irradiated 3-day old pupae. The females were found to be more radiosensitive than the males. Pupa was more resistant to gamma radiation than the larvae or eggs.

Agr. 305 Alam, M. Z. 1969. **Field trials with organophosphorus insecticides, labaycid, folithion and gusathion for the control of jute semilooper in East Pakistan.** Annu. Rep. Div. Entomol.

Field trials were conducted in June 1968 on Jute semilooper, *Amomis* (= *Cosmophila*) *sabulifera* and Jadurchar near Fulbari, Dacca with three organophosphorus insecticides, Lebaycid, Folithion and Gusathion. The tests were conducted in factorial experiments with randomized complete block design having three replications for treatment of each two dosage rates. The plot size was 1/40th of an acre. Population counts were made at an interval of 24, 48 and 72 hours after spray including those of the control. The results were recorded and analysed. It is concluded that all these three insecticides were effective to control jute

semilooper upto the extent of 80-100 per cent at the rate of 10 oz. active material of lebaycid, Folithion and 8 ox. active material of Gusathion per acre.

Agr. 306 Bhuiyan, N. I. 1970. **Incidence of various parasites of jute hairy caterpillar, *Diacrisia obliqua* Walker under field condition.** *Res. Rep. Evaluation and Coordination Commi. Directorate Agr. Govt. East Pakistan. 2 p.*

Six different species of dipterous and hymenopterous parasites were collected from the field. Only two of them were identified and the rests are yet to be identified. *Apanteles obliqua* Walk. a larval parasite was usually found to attack the 1st and 2nd instar larvae. The full grown larvae of the parasite emerged from the body of the host larvae within 10-15 days and pupated in silk cocoons on the surrounding leaves or stems. The pupal period lasted for 2 to 3 days. The sex-ratio varied from generation to generation. In dry season, the attack of *Apanteles* sp. varied from 1 to 25%. In dry season, the percentage of dipterous parasites increased (range, 0 to 40%). They took longer time to complete the life-cycle. Larval period lasted for 15 to 20 days and pupation took place within the body of host pupa. Usually, single parasite of *Tachinid* sp. came out of host pupa within 8 to 9 days.

Agr. 307 Bhuiyan, N. I. 1970. **Studies on the feeding and development of jute scopula, *Scopula emmisaria* Walker (Noctuidae : Lepidoptera) on different host plants.** *Res. Rep. Evaluation and Co-ordination Commi. Directorate Agr. Govt. East Pakistan. 2 p.*

Larvae of jute Scopula were reared on several kinds of food plants under four larval densities at room temperature. Feeding activities of larvae and their development of *Casia tora* L., *Moringa oleifera* Lam., *Hibiscus rosasinensis* L., *Vigna sinensis* Savi., *Phaseolus mungo* L., *Tageteo putula* L. and *Polyanthes tuberosa* L. were similar to those reared on jute plants. During off-jute season, larvae were reared on these plants at very low density and the duration of the generation became too long (50-70 days) and that was short during jute season (30-40 days). Moreover, larval period was long in isolated cultures (14-18 days) with 5-6 moults and in crowed cultures that was short (11-15 days) with only 5 moults. Sexual dimarphism was prominent. Male pupae and adults were smaller and lighter than the female ones. Larval and pupal mortality were high in crowded cultures. Isolated females produced more egg (400-500 eggs/female) with short preovipositional period and longevity than the crowded ones (50-200 eggs/ female) with long preovipositional period and longevity.

Agr. 308 Bhuiyan, N. I. 1970. **Life tables for jute hairy caterpillar, *Diacrisia obliqua* Walker (Arctiidae : Lepidoptera).** *Res. Rep. Evaluation and Co-ordination Commi. Directorate Agr. Govt. East Pakistan. 2 p.*

The life tables for jute hairy caterpillar for two seasonal cohorts, jute season (June to August) and off-jute season (October to December) were prepared for both larvae and adults. Survivorship curves for jute season were relatively different from those for off-jute season. High mortality at egg and larval stages as well as later adult stages during off-jute season was most conspicuous. The adult longevity slightly lengthened and the survivorship curves

dropped approximately with the same rate during jute season. A remarkable similarity of survivorship curves between *Diacrisia* and *Drosophila* was obtained due to apparently high aggressive behaviour in both. The average longevity of adult varies seasonally and it is relatively long in June and July, and short in November and December. The larval life lengthens very much in the months of November and pupal mortality decreases.

Agr. 309 Sorker, A. B. and N. I. Bhuiyan. 1970. **Studies on the effect of certain organophosphorus insecticides in controlling the jute hairy caterpillar, *Diacrisia obliqua* Walker (Actiidae : Lepidoptera).** *Res. Rep. Evaluation and Co-ordination Commi. Directorate Agr. Govt. East Pakistan. 2 p.*

The object of this study was to determine the effective dosages of certain organophosphorus insecticides commonly used for the control of insects in East Pakistan. Five different candidate compounds were applied to both *Corchorus capsularis* L. and *Corchorus olitorius* L. in field and potted plants. It was found that the second instar larvae were more susceptible to the chemicals and the susceptibility decreased gradually with the advancing age of the jute hairy caterpillar. A comparative study of the field and laboratory trials revealed that greater amount of insecticides were required to achieve 50% or more kills of the jute hairy caterpillar under field conditions. Diazinon and Sumithion were the most promising among the candidate compounds. In the laboratory trials, Diazinon was most effective against 3rd and 4th instar larvae feeding on *C. capsularis* L. while Sumithion was superior to all compounds against 2nd instar larvae on both species of jute and 3rd instar ones on *C. olitorius* L. LD₅₀ and LD₉₀ values of Sumithion, Diazinon, Nogos, Dimecron and Carbicron were significantly different on both species of jute.

Agr. 310 Alam, M. S. and M. Abbas. 1971. **Field trials with zolone, elsan, accothion and nexagon for the control of jute semilooper, *Amomis sabulifera* (G).** *Proc. 23rd Pakistan Sci. Conf. Peshawar.*

Experiments were conducted at Jadurchar, Dacca in June 1968 with foliar insecticides, Zolone, Elsan, and Nexagon to find out their effectiveness for the control of jute semilooper, *Amomis sabulifera* (G.) with 0.5 lbs. active material per acre. The experiments were conducted in randomized block design replicated three times along with control. Each plot was of 33' x 33' with five feet border effect (unsprayed) left between two sub-plots. It transpired from the study that Elsan and Accothion were found very effective for the control of jute semilooper achieving 100% mortality 24 hours after spray. Nexagon achieving 87% and 90% mortality respectively 24 hours after spray.

Agr. 311 Bhuiyan, N.I. and M. A. Sardar. 1971. **Studies on the phase variation in jute hairy caterpillar *Diacrisia obliqua* Walker (Lepidoptera : Arctilidae).** *Pakistan J. Zool.* 3 (1) : 101-121.

This study was undertaken to determine the phase status of jute hairy caterpillar, *Diacrisia obliqua* Walker, in response to rearing density under laboratory conditions. It was observed that the larval density of this species plays an important role on the duration of larval instars, morphometrics, colour patterns of larvae, their behavior and food consumptions which are characteristic features of phases of locusts and other lepidopterous insects. Larval density also affects the pupal and adult morphometrics, sexual dimorphism, preovipositional, and ovipositional periods, fecundity and adult longevity. Density-independent factors such as temperature, and relative humidity are also related to this type of density-dependent polymorphism in jute hairy caterpillar.

Agr. 312 Bhuiyan, N. I., M. R. Hoque, and A. B. Borkovec. 1971. **Chemosterilization of Jute hairy caterpillar, *Diacrisia obliqua* Walker by injection of certain chemical sterilants.** *Abs. 23rd All Pakistan Sci. Conf. Sec. D-47.*

The experiment was conducted to determine the effective dosages of the candidate compounds which were applied to the anal region of 5 days old pupae with the help of micro-syringe or micro-pipette. Each treatment was replicated 5 times at room temperature. Four combinations of adults were made within 12 hours after emergence:- (i) TM x UtF; (ii) UtM x TF; (iii) TM x TF; and (iv) UtM x UtF. Heterogeneity was observed among the treated groups of pupae in respect of adult emergence, formation of incomplete body and wings, mating and behavior, preovipositional and ovipositional periods, fecundity and viability of eggs. Both sexes treated with 1-8 L of hempa, hexamethylmelanine hydrochloride, N, N, N', N'-tetramethyl-P-piperi-dinophosphonic diamide and 5-fluoroorotic acid produced only 0-10% of viable eggs and when only females were treated with higher dosages of these compounds (8-16 L/pupa) produced 0-8% of viable eggs. Males treated with higher dosages of metepa, thiohempa, hempa and derivatives, of S-triazine, phosphoramidate, aziridinyl and purine groups reduced the number of viable eggs in untreated females. Most of the compounds were specific to individual sex and were effective at more than 4 L per pupa.

Agr. 313 Sardar, M. A. and N.I. Bhuiyan. 1971. **Methods of controlling jute Hairy caterpillar, *Diacrisia obliqua* Walker by certain organophosphorus insecticides.** *Abs. 23rd. All. Pakistan Sci. Conf. p. 48-49.*

Jute hairy caterpillar causes substantial damage to the growing jute plants in East Pakistan. The caterpillars remain in aggregation during their early instars (i.e. 1st to 3rd instar). During these stages for about 8-10 days after hatching, they feed on the epidermal layers of leaves and exhibit various colour patterns. At the onset of 4th instar, the colour patterns become intensified and the darker ones (i.e., dark yellow, yellow-red, dark orange and red orange types) feed vigorously on leaves including ribs. On the other hand, light coloured larvae (i.e., yellow green, light yellow and yellow types) feed very slowly and mostly remain isolated

from the darker ones. The object of this experiment was to determine whether these two types of larvae were equally susceptible to the same dosage of five organophosphorus insecticides (i.e. Sumithion, Diazinon, Carbicron, Bidrin and Nogos) that would be applicable to the different developmental stages of this insect. It was observed that LD₅₀ and LD₉₀ values in laboratory experiment on 3rd, 4th, and 5th instars' dark coloured larvae were significantly greater than those on light coloured ones. The susceptibility of insecticides to the dark larvae gradually decreased at successive instars. Diazinon, Nogos and Sumithion had lower LD₅₀ values (range, 128.0 ppm to 264.2 ppm., 286.8 ppm to 620.9 ppm., and 331.1 ppm. to 1169.0 ppm.) than those of Bidrin and Carbicron at 3rd, 4th, and 5th instars respectively.

Agr. 314 Bhuiyan, N.I. and M. A. H. Usmani. 1972. **Mass rearing of jute hairy caterpillar *Diacrisia obliqua* Walker (Arctiidae : Lepidoptera) on artificial diets.** *Nucl. Sci. Appl.* 6 : 88 - 93..

Successful rearing of jute hairy caterpillar, *Diacrisia obliqua* Walker on artificial diet provided excellent informations on the basic essentials of nutrient for uniform growth and development of the larvae and the laboratory technique to colonize them at a minimum costs. Jute hairy caterpillar required higher percentage of sucrose than glucose as feeding stimulant besides casein, cholesterol, choline chloride, ascorbic acid and dietary inorganic ions. The presence of jute leaf powder in the diet accelerated the feeding responses of the larvae. Adults do not usually feed except a slight amount of sugar in solution and they build up fat reserves and glycogen from the dietary cholesterol during feeding.

Agr. 315 Malek, M. A. and S. M. A. Kabir, 1972. **Toxicological studies on some insecticides on jute hairy caterpillar. *Diacrisia obliqua* Walter.** *M.Sc. Ag. Thesis, Bangladesh Agr. Univ. (MS).* 50 p.

To toxicity of Diaxinon, Dimecron, Nogos, Birlane and Anthio on 3rd and fifth instar larvae of jute hairy caterpillar, *Diacrisia obliqua* Walker was described under laboratory condition. Typically they were highly toxic to both third and fifth instar larvae depending on the time of exposure. Birlane was found to be more effective in oral treatments than other chemicals.

Agr. 316 Shahjahan, M. and M. A. H. Hamid. 1972. **Comparative resistance of some radiation-induced jute plant mutants to jute Weevil, *Apion corchori* Marsh.** *Nucl. Sci. Appl.* 6 (A) : 59-63.

Some mutants of the mother varieties, D-154 of (Deshi) *Corchorus capsularis* L. and C. G. of (Tossa) *C. olitorius* L. jute plants were examined in order to evaluate the degree of resistance to the jute weevil, *Apion corchori* Marsh (Coleoptera, Curculionidae). The mutants C-38 (high yielding) and C-26 (early maturing) of *Capsularis* plants did not prove to possess any higher degree of resistance than that of the mother variety D-154. However, the other mutants C-30, C-22 (seg) and C-23 (seg) showed a higher degree of apion-resistance. Among the *olitorius* population it appeared to decrease in all the mutants except O-12, which was in the segregating stage. In general, the *olitorius* plants were more resistant than the *capsularis*

plants. The percentage of plant attacked and the average attack per plant was much higher in the latter than in the former plants. Plant toughness, mucilaginous substances, plant chemicals and some associated ecological phenomena were attributed to be responsible for such difference in the level of resistance.

Agr. 317 Shahjahan, M. and Bhuiyan, N. I. 1972. **Histological effect of diazinon and metasystox-R on the alimentary canal of jute hairy caterpillar, *Diacrisia obliqua* Walker.** *M.Sc. Ag. Thesis, Bangladesh Agr. Univ. (MS)*. 39 p.

Histological studies were made on the alimentary canal of jute hairy caterpillar, *Diacrisia obliqua* Walker to determine the effect of diazinon and metasystox-R. The procedures employed were fixing, sectioning and staining the sections of alimentary canal of the treated and untreated larvae. In most cases severe histological changes were observed in the diazinon treated larvae. The changes occurred in the cells of the fore and mid-gut than the hind gut. Death of the larvae from the treatments of diazinon and diazinon and metasystox-R might be due to the destruction of the mid-gut epithelial lining and inhibition of certain enzymic activities of the gut walls.

Agr. 318 Shahjahan, M. 1973. **Methods of screening radiation induced jute mutants for resistance to the jute weevil *Apion corchori* Marsh (Coleoptera, Curculionidae).** *Nucl. Sci. Appl.* 7 (A) :

The jute variety, D-154 (*Corchorus capsularis*) was treated with ionizing radiation and several jute plant mutants were evolved from it. They were the C-22 (seg), C-26 (seg), C-29 (seg), C-34, C-34 p.c., C-35 and C-38 (seg). These mutants were cultivated in the Tongi Atomic Energy Agriculture Experiment Station, Dacca, and exposed to natural infestation for estimating their resistance to the jute weevil, *Apion corchori* Marsh. But there was no known way of determining their damage by the jute weevils. Therefore, it was considered very essential to find out an effective screening method for evaluating the resistance of the jute weevils in the jute plants. Three methods were found to be more or less equally effective. They were the average attack, height-unit and frequency method. The results obtained by each one of them were analyzed and compared. Each method recorded the highest attack for C-34 (seg), and C-22 (seg). Hence the C-34 mutant seemed to be more susceptible when compared with other jute mutants.

Agr. 319 Shahjahan, M. and N. A. H. Miah. 1973. **Studies on the susceptibility of some radiation induced jute mutants to the jute hairy caterpillar, *Diacrisia obliqua* Walk. (Lepidoptera Arctiidae).** *Nucl. Sci. Appl.* 7 (A) :

Several radiation induced jute mutants of the mother variety, D-154 (*Corchorus capsularis*), were studied for their resistance to the jute hairy caterpillar, *Diacrisia obliqua* Walk. They were C-28 (seg), C-26 (seg), C-29 (seg), C-34, C-34 p.c., C-35 and C-38 (seg). The resistance of these mutants to the hairy caterpillars was estimated by feeding them a certain amount of jute leaves of each mutant for a fixed period of time. The amount of leaves eaten

during this fixed time was taken as a measure of their pest susceptibility. The results showed that an average of 48.3% of the leaves (dry matter) of the C-26 (seg) mutant was eaten. Whereas, it was only 28.8% for C-38 (seg) and 31.9% for the mother variety, D-154 (control). Therefore, the C-26 (seg) seemed to be comparatively more susceptible to the hairy caterpillars than other mutants. The C-38 (seg) appeared to be slightly less susceptible when compared with other mutants.

Agr. 320 Shahjahan, M. 1973. **Distribution patterns of the grubs of jute weevil, *Apion corchori* Marsh (Coleoptera, Curculionadae) on some radiationinduced jute mutants.** *Bangladesh J. Biol. Agr. Sci.*

The population distribution patterns of the grubs of the jute weevil, *Apion corchori* March were studied in the D-154, C-38 and C-28 jute fields. The latter two were the mutants evolved from D-154 by ionizing radiation. These plants grew to different heights in the present study plots. The weevils attacked them several times during their growing season and these attacks were found to have no relation with the plant heights. They were almost equal on both short and tall jute plants. However, most of the grubs were found over the basal and middle region of the plants. The distributional studies of these grubs in the whole revealed two patterns. They were clumped and random. The former occurred when all the D-154, C-38 and C-28 plant samples were analyzed together. But the single plot analysis showed random distribution in the D-154 and C-28 and clumped in the C-38 fields. The clumping of the grubs in the combined analysis was attributed to the samples collected from the C-38 plots. This indicated the susceptibility of the C-38 mutant as compared to other plant types, to the attack of the grubs.

Nutrition

Agr. 321 Chaudhuri, S. D. and D. H. Khan. 1961. **Split application of NPK fertilizers of jute (*C. olitorius* in two major soil types of East Pakistan.** *Proc. 13th Pakistan Sci. Conf. Abs. Sec. Biol. p. B-13.*

Single and combined doses of nitrogen, phosphorous, and potassium fertilizers (ammonium sulphate, superphosphate, and muriate of potash respectively) were used in two major soil types of East Pakistan viz. Tejgaon clay (Dacca Farm soil)- a Madhupur Tract soil with genetic characteristics of red podzolic group, and Kishoreganj clay loam (Kishoreganj Farm soil)- a Brahmaputra alluvium soil, were selected for this study. The experiment, continued for three years (1955, 1957 and 1958); showed that in Tejgaon clay soil type (Dacca Farm), the application of half dose of NPK fertilizer mixture after thinning operation (about two weeks after sowing), and half dose about month and a half after sowing, accounted for maximum vegetative growth and fibre yield of jute. Similar result was also obtained in Kishoreganj clay loam soil type (Brahmaputra alluvium) in 1955 trial only. Considering the effect of single application of nitrogen fertilizer only, it was found that split application in two instalments was always beneficial under both the soil conditions. Split application of phosphorous and potash was also found to be instrumental in promoting vegetative growth

and fibre yield of jute in Tejgaon clay (Dacca Farm soil). Under Brahmaputra alluvium soil condition (Kishoreganj Farm) split application of nitrogen and phosphorous in two instalments accounted for maximum fibre yield, the effect due to nitrogen being more pronounced than that due to phosphorous. Application of potash at different stages of plant growth did not however show a clear trend in Kishoreganj clay loam.

Agr. 322 Chaudhuri, S. D. and D. H. Khan. 1961. **Response of jute to nitrogen and potash nutrients in different alluvial soil types of East Pakistan.** *Proc. 13th Pakistan Sci. Conf. Abs. Sec. Biol. p. B-12.*

A fertilizer trial carried out in cultivators' plots under different soil-climatic conditions to evaluate the single and combination effect of nitrogen and potash nutrients on the yield of jute fibre. the sites of the experiments were different sub-station centres of the Pakistan Central Jute Committee scattered all over three jute soil tracts, viz. Brahmaputra alluvium, Gangetic alluvium, and Teesta silt. The experiment was laid out in randomised block design; number of fertilizer treatments were eight; number of replications were three *C. capsularis* seeds were sown in low-lying area and *C. olitorius* seeds in highlands. Nitrogen was added from cow-dung and ammonium sulphate, and potassium from water-hyacinth ash. The level of nitrogen was maintained at 30 lbs. N/a and that of potassium at 14 lbs. K₂O/a in 1956, 1957, and 1958 trials. The levels of nitrogen and potassium were however raised to 40 lbs. N/a and 22 lbs. K₂O/a respectively, in 1959 trials. Economics of fertilizer use was calculated on the basis of Y/C ratio (a ration of value in increase in yield to cost of fertilizers) and net economic return. It is observed that the ($\frac{1}{2}N + \frac{1}{2}C + A$) treatment with 38 mds. 15 srs. of cow-dung (15 lbs. N) per acre, 36.5 srs. of ammonium sulphate (15 lbs. N) per acre, and 1 md. 20 srs. of water-hyacinth ash (14 lbs. K₂O) per acre, would fairly meet the nitrogen and potash deficiencies in soils and give the cultivators a net economic return. It was found that in Brahmaputra alluvium, the net economic return due to this particular mixed fertilizer treatment was Rs. 62.7/a with Y/C ratio of 3.32; in Gangetic alluvium the net return was Rs. 30.5/a with Y/C ratio of 2.12; and in Teestan silt the return was Rs. 24.6/a with Y/C ratio of 1.91.

Agr. 323 Khan, D. H. and A. Ali. 1961. **Effect of potash, as contributed from water-hyacinth ash and muriate of potash, on the growth and nutrition of jute (*C. capsularis*).** *Proc. 13th Pakistan Sci. Conf. Abs. p. B-14.*

Importance of potassium in plant nutrition has been emphasised and it has been reported that his major nutrient element checks diseases of jute and improves the fibre quality. A work was therefore initiated to study the effect of potassium, as contributed from water-hyacinth ash and muriate of potash on the growth and nutrition of jute (*C. capsularis*). The experiment was laid out in randomised block design under Dacca soil condition. It is observed that potassium (applied at 25lbs. K₂O/acre) markedly increased the vegetative growth and fibre yield of jute, net increase in fibre yield over control being about 7 mds/acre. Comparing the sources of *Potassic nutrient*, it is found that water-hyacinth ash played a better role in promoting growth and yield of jute. Data on nutrient uptake showed that potash supply definitely increased potassium concentration in apical part of jute plant at growing and harvest stages of growth. It was further noted that potassium, contributed from water-hyacinth ash, affected a greater degree of potash assimilation than that contributed from muriate of potash.

Agr. 324 Chaudhuri, S. D., D. H. Khan and M. A. Ali. 1962. **Effectiveness of potash fertilizer on jute crop under Tajgaon clay soil conditions.** *Proc. 17th Pakistan Sci. Conf. Abs. Sec. Agr. p. A-47.*

Positive effect of potassium on the growth and yield of jute crop (*C. capsulris*, var. D-154) has been shown in series of experiments laid out in Tajgaon soil (Dacca Farm) in several years. The results presented below are computed from part of NPK fertilizer trial, and treatment effect of potassium (as muriate of potash) was calculated combining all levels of nitrogen and phosphorous. The marked effect of potash on the yield of jute crop grown in Tajgaon soil, has been observed in all the three years. Statistical analysis for liner effect was highly significant which indicated that the differential effect increased proportionately with increasing potash supply. Economics of fertilizer use, calculated on the basis of weighted average price of loose unassorted fibre and unsubsidised purchase of fertilizr, show a substantial economic return. The experimental findings on significant crop response to potash indicated marked potash deficiency in Tajgon clay soil type (Dacca Farm) which was deduced to be due to chemical precipitation and specific clay mineral intake (X-ray diffraction data) of potash within the crystal lattice. Further study on the effectiveness of potash fertilizer of jute crop under alluvial soil conditions is in progress.

Agr. 325 Chaudhuri, S. D., D. H. Khan and M. T. Islam. 1962. **Fibre yield of jute crop as affected by ammonium sulphate application to soilb.** *Proc. 14th Pakistan Sci. Conf. Abs. Agr. p. A-46.*

Effectiveness of ammonium sulphate (inorganic nitrogenous fertilizer) on the growth and yield of jute (*C. capsulris*) was studied under Tejgaon soil (Dacca Farm) condition. Three years' average results as shown below, reveal progressive increase in fibre yield up to a high limit of nitrogen supply to soil, net increase over control at N₅ level being 10.86 mds. of fibre/acre. A highly appreciable net economic return was calculated on the basis of weighed ten years average of loose unasserted fibre and unsubsidised fertilizer purchase. Jute crop responds to the high nitrogen supply was suggestive of initial acute nitrogen deficiency in soil, and this was experimentally found on a series of researches on nitrogen status of this soil type.

Agr. 326 Haque, M. Z. 1962. **Study on the volatilization loss of urea-N from soil in relation to jute culture.** *M.Ag. Thesis. Dac. Univ. (MS).*

A study on nitrogen transformation of urea and N losses due to volatilization was undertaken on four representative soil types of the country under laboratory condition. It was found that ammonification of urea takes place completely within a week of application and the loss of urea-N by volatilization ranged from 21% to 66% after two weeks of application. The maximum loss took place in Natore silty loam, a calcarious soil and minimum loss being in Tejgaon clay, an acid soil, containing ferrugenous clayed material. Having assessed the extent of volatilization loss, an attempt was made to minimise the loss of urea-N by placement of urea at a depth of 2 inches of soil and the loss was checked from 44 to 91 per cent. The loss

was further checked by placing urea in combination with T.S.P. Jute (*C. olitorius*) was grown in the field with urea application at different depths. The process of ammonification was found to be more rapid in the field than laboratory condition. A greater amount of ammonical-N was accounted in the cropped field than fallow field. Depth placement of urea in the field retained more nitrogen as the depth increased 0 to 4 inches downwards. It was further observed that placement of urea or urea + T.S.P. at 2 inches depth, accounted for maximum plant height, stem thickness although the period of study.

Agr. 327 Khan, D. H. and S. I. Chaudhury. 1962. **Yield response of jute fibre and its relationship with soil phosphate.** *Proc. 14th Pakistan Sci. Conf. Abs. Agr. p. A-47-48.*

An experiment was carried out in Tejgaon clay soil type (Dacca Farm) under field condition to find the yield response of jute fibre (*C. capsularis*, var. D-154) to phosphate supply. The P-treatments studied in this piece of research were 0 lbs. P_2O_5 , 45 lbs. P_2O_5 , 90 lbs. P_2O_5 , 135 lbs. P_2O_5 and 180 lbs. P_2O_5 /acre. Despite high phosphate application to this soil type, jute plant showed a low yield response to phosphorous supply, the response being however progressive up to 180 lbs. P_2O_5 /acre level. Phosphorous trials on jute in earlier years have also shown a poor crop response to phosphate application to Tejgaon soil. In order to throw some light on this problem centering around low crop response to soil and fertilizer phosphate, further experiment was carried out in Tejgaon clay soil type under field condition to evaluate the fate of applied soluble phosphate in soil. Phosphorous transformation in soil studied was confined to the following forms, available P_2O_5 , absorbed P_2O_5 , sesquioxide bound P_2O_5 , and total P_2O_5 . Results showed that 88 per cent of added P_2O_5 has been thrown out of available phase just three days after superphosphate application. It is further observed that this alarmingly high degree of phosphate unavailability continued throughout the period under study i.e. upto 56 days after phosphate application. Phosphate unavailability has been experimentally observed to be largely due to chemical binding with sesquioxides (iron oxide and alumina, which are dominantly present in the soil type) and adsorption on soil colloids. From the study on the chemistry of phosphate transformation in soil colloidal system, it could be deduced that low crop response to soil and fertilizer phosphate was due to alarmingly high fixation of initial and added phosphate in soil.

Agr. 328 Khan, D. H. and S. I. Chowdhury. 1962. **Carbohydrate and protein content of jute plant as affected by soil and fertilizer phosphate.** *Proc. 14th Pakistan Sci. Conf. Abs. Agr. p. A-50.*

Protein synthesis and carbohydrate build up as affected by phosphate availability to jute crop (*C. capsularis*, var. D-154) was studied under field condition in Tejgaon clay soil (Dacca Farm). The protein and carbohydrate (hydrolysable) content of jute plant was determined on the oven-dried ground up sample of mature plant. It was observed that protein synthesis showed an increase with phosphorous supply up to 90 lbs. P_2O_5 /acre level, and further increment in P-supply decreased the protein content. Carbohydrate content showed a gradual increase with phosphorous supply which might be according to some workers, due to greater depression of photosynthesis by phosphorous deficiency.

Agr. 329 Khan, D. H. and S. I. Chowdhury. 1962. **Fibre quality of jute crop as affected by phosphate supply to soil.** *Proc. 14th Pakistan Sci. Conf. Abs. Agr. p. A-49-50.*

A study has been undertaken to find out the effect of phosphorous supply on the quality of jute fibre (*C. capsularis*). Fibre quality has been taken to be positively correlated with the length of ultimate fibre and negatively with the ultimate fibre breadth. The experiment was laid out in Tejgaon clay soil type (Dacca Farm) under field condition in randomised block design. Different levels of phosphorous in the form of superphosphate were used such as 0 lbs. P_2O_5 , 45 lbs. P_2O_5 , 90 lbs. P_2O_5 , 135 lbs. P_2O_5 180 lbs. P_2O_5 /acre. The ultimate length and breadth of jute fibre was studied according to standardised chemical treatments showed by microscopic analysis. The ultimate fibre length data show that phosphate supply has progressively increased the ultimate length and maximum increase was observed at 180 lbs. P_2O_5 /acre level of supply, the per cent increase over control being 26.3. Data on ultimate breadth of fibre show a negative effect of phosphate supply. The results on ultimate fibre measurements were statistically significant at one per cent level.

Agr. 330 Khan, D. H. and S. I. Chowdhury. 1962. **Phosphate : Iron relationship in the nutrition of jute plant (*C. capsularis*).** *Proc. 14th Pakistan Sci. Conf. Abs. Agr. A-49.*

A study has been undertaken to evaluate the interrelationship of phosphorous and iron in the nutrition of jute plant (*C. capsularis*), the experiment being laid out in Tejgaon clay soil type (Dacca Farm) under field condition. Iron determination in plant was done according to standardised chemical treatments followed by sensitive colorimetric method. The oven-dried, ground up samples of mature jute plants were analysed. The results show a fair amount of iron uptake by jute plants which would represent both ferrous and ferric forms of iron. Whilst iron, being an essential constituent of chlorophyll, is to be extracted by jute plant from soil which in this particular case is a Fe_2O_3 enriched growth substrate, the appreciable iron uptake is quite likely. The results show increased iron uptake at 90 lbs. P_2O_5 /acre level, but further phosphate supply decreased uptake of iron. This is in agreement with findings of some research workers who observed that too high a phosphorus concentration in the growth substrate would reduce iron uptake by plant.

Agr. 331 Khan, D. H. and B. C. Mandal. 1962. **Germination of jute seed in relation to ammonia formation in soil.** *Proc. 14th Pakistan Sci. Conf. Abs. Sec. Agr. p. A-52.*

Effect of urea on the germination of jute seed (*C. capsularis*, Var. D-154) has been studied in two soil types viz., Tejgaon clay (Red podzolic soil) and Tarabo silty loam (Brahmaputra alluvium) under laboratory controlled conditions. Different doses of urea-N (0 lbs. N to 360 lbs. N/acre basis) and different time intervals of urea application were considered to lay out the experiment in petridish at 30°C. Hydrolysis of urea and ammonia formation in soil were studied in a separate experiment in order that the germination observation data could be explained. The results in both the soil types showed increasing toxic effect of urea on germination of jute seed with higher doses and maximum harmful effect of urea was noticed due to its application at seed bed i.e. just before sowing. The toxicity of urea on germination

with higher doses (120 lbs, N, 180 lbs. N and 360 lbs, N/acre seemed to have persisted up to one week after urea application in Tejgaon clay and two weeks after urea application in Tarabo silty loam. The toxicity of urea which is due to the deleterious effect of volatilized ammonia on seed germination, has been also observed by many workers. Tarabo silty loam is more susceptible to urea toxicity in respect of jute seed germination than Tejgaon clay. Chemical data on urea hydrolysis showed greater degree of ammonification in Tarabo silty loam than that in Tejgaon clay. The higher rate of ammonification in Tarabo silty loam has been thought to be conducive to inhibitory effect on germination which was been more marked in Tarabo soil than in Tejgaon soil.

Agr. 332 Khan, D.H. and B. C. Mandal. 1962. **Response of jute crop (*C. capsularis*) to urea-N supply under different soil conditions.** *Proc. 14th Pakistan Sci. Conf. Abs. Sec. Agr. p. A-51.*

The experiment has been laid out in two soil types of East Pakistan, viz., Tejgaon clay (Red podzolic soil) and Tarabo silty loam (Brahmaputra alluvium). The results showed that nitrogen supply progressively increased the fibre yield up to 150 lbs. N/acre (6.67 mds/acre over control) in Tejgaon clay and further increase in N-supply depressed the yield. It was found that the dose 150 lbs. N/acre accounted for a significantly (at 1 per cent level) better result over all other doses. In Tarabo silty loam maximum fibre yield was obtained at 120 lbs. N/acre level and net increase over control was 4.2 mds/acre. Further increase in N-supply in this soil type decreased the yield. Analysis of variance however does not show any significant difference in Tarabo soil. In both the soil types the results show appreciable economical return and a high Y/C ratio. The first increment in nitrogen supply (90 lbs. N/acre) in Tejgaon soil increased the ultimate fibre length which is statistically significant at 1 per cent level and further increase in N-supply decreased the fibre length.

Agr. 333 Khan, D. H. and B. C. Mandal. 1962. **Urea hydrolysis and nitrogen availability in soil under jute cultivation.** *Proc. 14th Pakistan Sci. Conf. Abs. Sec. Agr. p. A-51.*

Hydrolysis of urea and release of available-N in the form of NH_4 and NO_3 nitrogen as influenced by different cultural practices have been studied in Tejgaon clay (red podzolic soil) under field condition. Result showed that maximum ammonification was observed within 10 days after urea application and the process gradually slowed down whereas nitrification process showed the maximum intensity about 30 days after urea application. Considering ammonia and nitrate nitrogen together as available-N, it is observed that the maximum production of available-N takes place round about 30 days after urea application. Liming has shown to some extent a favourable effect on ammonification and nitrate production which may be due to increased numbers of nitrifying organisms enhanced by addition of lime. Liming has shown an initial gain in nitrogen status in soil which might be due to enhanced mineralization of organic matter and check of nitrogen loss by leaching. Cropping effect accounted for depletion of $\text{NH}_4\text{-N}$, $\text{NO}_3\text{-N}$ and total N when the jute plants obtained a certain degree of growth. This is thought to be due to the growth. This is thought to be due to the absorption of NH_4 and NO_3 ions by jute plants.

Agr. 334 Khan, D. H. and B. C. Mandal. 1962. **Diagnosis of nitrogen deficiency in jute plants grown in Tejgaon clay.** *Proc. 14th Pakistan Sci. Conf. Abs. Sec. Agr. p. A-50.*

The experiment was carried out under Dacca Farm soil condition (Tejgaon clay). In order to study the diagnosis of nitrogen deficiency in jute plant tip leaves sampled at growing and mature stages were analysed for $\text{NH}_4\text{-N}$ and $\text{NO}_3\text{-N}$ content and the visual observation of deficiency symptoms was noted at growing and mature stages. The data of $\text{NH}_4\text{-N}$ and $\text{NO}_3\text{-N}$ uptake by tip leaf of growing and mature stages were correlated with growth data. The curve showed an initial ascent up the slope, a point of inflexion and then downward bend. It therefore appeared that ammoniacal-N and nitrate-N of tip leaf around 0.0024 per cent and 0.019 per cent respectively might be taken as the optimum level at mature stage below which nitrogen deficiency would set in. At growing stage of jute plant optimum value of $\text{NH}_4\text{-N}$ and $\text{NO}_3\text{-N}$ in tip leaf would be 0.07 per cent and 0.041 per cent respectively. The field observation showed visual symptoms of nitrogen deficiency at lower level of N-supply and the symptoms were acutely prominent at 0 lbs. N/acre (control plots). The symptom included (a) pale green and yellowish colour of leaf, (b) stunted growth and slendering of stem (c) drying of older leaves and marked leaf fall.

Agr. 335 Khan, D. H. and A. C. Roy. 1964. **Growth, P-uptake and fibre cell dimensions of jute plant as affected by silicate treatment.** *Plant and Soil. 20 (3) : 331-336.*

A study on the effect of silicate on the growth, phosphorous uptake and fibre cell dimensions of jute plant (*Corchorus capsularis*) was made in pots. The plants were grown in Tejgaon clay (a ferruginous soil) soil. Silicate increased plant growth and yield, and P-uptake under both limes and unlimed conditions. A greater cell elongation, fineness and elongation/fineness ratio was also observed due to silicate treatments. Better plant growth enhanced P utilization. Elongation and fineness of fibre cells were assumed to be due to increased P-availability in the soil influenced by silicate treatment.

Agr. 336 Ali, M. M. and A. Rahman. 1965. **The effect of certain rhizosphere microflora on the utilization of certain fertilizers by jute plants.** *Pakistan J. Soil Sci. 1 (2) : 44-47.*

Since of the three fertilizers, muriate of potash, superphosphate and urea tested with regard to their effect on the fibre yield of jute plants under varied soil microbial conditions, the fertilizer, and muriate of potash increased fibre weight under higher bacterial and fungal population of the soil. It would signify that it could be more profitable if the soil conditions were taken into consideration before the application of this fertilizer to the soil. In soils with high organic matter the yield was generally high. It is, therefore, very likely, in view of the findings of this research that the fibre will increase if the fertilizer, muriate of potash is added to the soil with high organic matter content. From this investigation it is difficult to comment as to how this fertilizer increases the fibre yield under higher soil microbial condition. This would itself make a separate problem calling for further investigation.

Agr. 337 Khan, D. H., A. M. Ibrahim and R. I. Chowdhury. 1965. **Effect of urea and ammonium sulphate on the germination and seedling growth of jute plant.** *Proc. 17th Pakistan Sci. Conf. Abs. Sec. Agr. p. A-23-25.*

An experiment was carried out to study the effect of urea and ammonium sulphate on the germination and seedling growth of jute plant. The experiment was set up under laboratory-controlled condition in petridish. Two soil types collected from Dacca Farm (Madhupur Red soil tract) and Tarabo Farm (Brahmaputra Alluvium) were sampled from 0-12 inches depth. Urea and ammonium sulphate were applied at the rate of 0 lbs. N, 60 lbs. N, and 120 lbs. N per acre on surface area basis at intervals of 0 days, 3 days and 7 days before sowing. *C. olitorius*, variety C. G. seeds were sown in experiment with urea and *C. capsularis*, variety D-154 seeds in experiment with ammonium sulphate. Soils in petri-dish were moistened regularly after fertilizer application. Germination was counted over-six days period and seedling growth in terms of hypocotyl and radical length was measured on sixth day after sowing. Results showed that urea application markedly inhibited germination which showed some improvement with increase in time interval between urea application and sowing. This was observed in both the soils studied. Measurement on seedlings showed that hypocotyl growth was reduced by urea application.

Agr. 338 Rahman, S. M. and M. Karim. 1972. **Nutrient uptake by jute plants at different stages of growth under solution culture condition.** *Nucl. Sci. Appl. 6 : A.*

In an experiment at a constant nutrient concentration under solution culture condition, maximum amount of NPK removed was observed during 55-65 days after sowing and this corresponds to highest dry-matter production. The higher per cent of K during 25-35 and 65-75 day periods was associated with the development of phloem tissues (cambial activity). Results of the field experiments where fertilizers were applied at appropriate time of optimum requirement based on these results have been discussed.

Agr. 339 Bhuiya, Z. H., M. Asadullah, M. S. Islam and M. A. Sattar. 1973. **Response of jute to nitrogen, phosphorous and potash fertilization.** *Bangladesh J. Agr. Sci. 1 (1) : 52-54.*

A fertilizer trial on jute (*Corchorus capsularis*) was carried out at the Bangladesh agricultural University Farm soil at Mymensingh with two levels of nitrogen, two levels of phosphorous and two levels of potassium. The application of nitrogen significantly increased the green and fibre yield. The phosphorous and potassium application did not produce any significant effect on the yield.

Pathology

Agr. 340 Ahmed, Q. A., R.W. Timm and M. Waseque. 1961. **Studies on the wilting of jute I. Breeding for varieties resistant to root-knot.** *13th Pakistan Sci. Conf. Abs. Sec. Biol. B-14-15.*

During 1958 jute growing season widespread wilting disease broke out with jute plants in most of the experimental plots at Kishoreganj. In one experimental plot with *Corchorus olitorius* (Variety C. G.) over 60% plants showed wilting. All of them had root system

severely affected with root-knots. In one nematode affected plot Ahmad and Samad (1959) set up an experiment with 21 varieties of jute and screened out a few varieties which they found comparatively free from root-knots. The experiment was repeated in 1960 with those tolerant varieties along with a number of new ones totaling thirty, nineteen of them belonged to *C. capsularis* and eleven to *C. olitorius*. Among the varieties only Japan Beniasa (*C. capsularis*) and Bomb-Japan (*C. olitorius*) were found highly tolerant to root-knot disease as was noted also in 1959 experiment.

Agr. 341 Ahmed, Q. A. and R. W. Timm. 1961. **Studies on the wilting of jute. III. effect of *Rhizoctonia* Alone and in combination with root-knot and lance nematodes.** *Proc. 17th Pakistan Sci. Conf. Abs. Sec. Biol. B-15-16.*

Isolations made during 1958 and 1959 jute growing season for fungal pathogens from the wilted jute plants having root-knots showed the presence of *Rhizoctonia solani*, *Macrophomina phaseoli*, *Diplodia corchori* and *Glomerella cingulata*. All these organisms were, however, isolated earlier by Wadud and Ahmed (1956) from wilted C.G. varieties of jute plants which had no root-knots in their root-system. Later, from jute plants (C. G.) which just began to show wilting symptoms whether with or without root-knots, always showed the presence of only one fungal pathogen, *Rhizoctonia solani*, on isolation. An experiment was therefore conducted, with *Rhizoctonia* alone and in combination with root-knot and Lance Nematodes in sterilized potted soil. Seeds of jute variety D-154 were sown in this experiment. Results noted with 12-day old seedlings showed that where *Rhizoctonia* was present alone or in combination with nematodes, a larger number of seedling exhibited post-emergent death. pre-emergent death was also invariably higher where *Rhizoctonia* was present. Compared to control, nematodes alone did not show any ill effect on seedlings. No wilting was however noted after 12 days growth of the seedlings till fruiting stage with any of the treatments.

Agr. 342 Ahmed, Q. A., A. G. Samad and M. Q. Kabir. 1961. **Studies on the comparative efficiency of different fungicides used as sprays against stem-rot and anthracnose disease of jute.** *Proc. 13th Pakistan Sci. Conf. Abs. Biol. B-17.*

To check the secondly infection through air-borne spores of *Macrophomina phaseoli* and *Colletotrichum corchori* to jute plants experiments were undertaken with a number of fungicides. Results so far obtained during last three years field trials showed that among Perenox (4 tolas in 20 srs. water), Brodeaux mixt. (16 tolas copper sulphate + tolas lime in 20 srs. water), Tuzet (2.5 tolas in 20 srs. water), and Perenox + Albolineum (4 tolas perenox + 7.5 cc albolineum). Tuzet gave comparatively good result followed by freshly prepared Bordeaux mixture. Besides showing better result in controlling stem rot and anthracnose diseases plants sprayed with Tezet remained green for a longer period of time (over 15 days) than the plants of the plots sprayed with any of the other fungicides including those of control.

Agr. 343 Ahmed, Q. A. 1961. **Jute disease and their control.** *Proc. 13th Pakistan Sci. Conf. Abs. Sec. Biol. B-17.*

A number of diseases have been found to occur to jute plant from its seedling to mature stages. The organisms responsible are *Macrophomina phaseoli* (Stem-rot), *Diplodia corchori* (Black band), *Colletotrichum corchorum* (Anthracnose), *Glomerella cingulata* (Die back and Anthracnose), *Rhizoctonia solani* (wilting), *Pythium* sp. (Damping off) *Cercospora corchorum* (Leaf spot), *Oidium* sp. (Leaf spot and blight) *Fusarium solani* (root-rot and wilt), *Choaniphora cucurbitarum* (Leaf blight), *Meloidogyne javanica* and *M. incognita* (Nematode root-knot). Besides, virus disease is also met frequently to both the cultivated varieties of jute. Some of these diseases are primarily seed and soil borne but they may also spread from other cultivated crops and wild hosts as secondary source.

By adopting some measures given below an effective control may be obtained.

These are :

- (i) Use of disease free seeds.
- (ii) Seed treatment.
- (iii) Timely spraying with fungicides.
- (iv) Avoiding cultivation of collateral hosts in and around the jute field.
- (v) Practice of rotation by paddy.
- (vi) Soil treatment.
- (vii) Roguing out of virus and other diseased plants from seed multiplication farm.
- (viii) Timely seed harvest and good storage.
- (ix) Using tolerant varieties evolved by Jute Research Institute.

Agr. 344 Ahmed, Q. A. and M. Q. Kabir. 1961. **Seed-borne diseases of jute and their prevention by seed treatment.** *Proc. 13th Pakistan Sci. Conf. Abs. Sec. Biol. B-16.*

During the last three years routine test of samples of jute seeds collected from various sources showed the presence of a number of parasitic organisms such as *Macrophomina phaseoli*, *Diplodia corchori*, *Colletotrichum corchori* and *Glomerella cingulata* in association with some saprophytic organisms. A few of the saprophytic organisms such as *Astergillus fumigatus*, *A. niger*, *A. flavus* and *Curvularia lunata* have been found to be harmful to the health of seeds in storage. The saprophytic organisms were however found to be controlled easily by seed disinfection by a fungicide but difficulty was experienced with internally seed-borne parasitic organisms. To find out suitable fungicides and their use at effective doses for obtaining a control, a number of fungicides were given trial. Hot water treatment was also included in this experiment. Both laboratory, green-house and finally with the promising fungicides field experiments were conducted. Among the fungicides, Agrosan GN (0.6%),

Agrosan SN (0.2%), Granosan M (0.2%) and Fernasan 75W (0.6%) gave more or less equally good check.

Agr. 345 Timm, R.W., Q. A. Ahmed and M. Waseque. 1961. **Studies on the wilting of jute. II. Effects of lime fertilizer on root-knot infection.** *Proc. 13th Pakistan Sci. Conf. Abs. Sec. Biol. B-15.*

Preliminary experiments in 1959 at the jute experimental farm, Kishoreganj indicated that lime fertilizer had some effect in reducing the amount and incidence of galling on jute roots due to root-knot nematodes (*Meloidogyne* spp.). To test this claim pot and field experiments were carried out in 1960 at the Jute Research Institute, Tejgaon, and further field experiments at Kishoreganj. Examination of rouged seedlings 20 and 27 days after planting showed that nematode reproduction was greatly slowed up by the application of lime at a rate of 1 gram per 1400 grams of soil. At harvesting the incidence of root-knot was 100% but the amount of galling was slightly less than in the controls. Green weight and fibre yield were slightly greater than in the controls. Lime fertilized pots infected with root-knot nematode in combination with *Rhizoctonia* showed as much galling as the controls and the green weight and fibre yield were the same. In field experiments incidence and amount of galling were as high in lime treated plots as in the untreated plots, but the green weight and fibre yield were higher. The conclusion drawn is that although initially nematode reproduction is impeded by lime fertilizer, the length of the growing season is sufficient for maximum or near maximum populations to build up.

Agr. 346 Timm, R. W., Q. A. Ahmed and M. Waseque. 1961. **Studies on the wilting of jute. IV. Effects of chemical treatment of soil on root-knot infection.** *Proc. 13th Pakistan Sci. Conf. Abs. Sec. Biol. B-16.*

Experiments on the control of root-knot nematode of jute by chemical treatment of soil were carried out in 1959 and 1960. Nemagon, a Nemaicide, was applied in pot experiments at a rate of 3 ml. per 5500 grams of soil, given as a drench. Inoculation with 500 root-knot larvae produced no infection by harvest time, neither alone or in combination with *Rhizoctonia*. In field experiments Nemagon was applied at a rate of 1 ml. and 2 ml. per linear foot at a depth of 6 inches. The incidence of infection at harvesting was 31% and 10% respectively, but the amount of galling was little. Green weight and fibre yield of plants in both plots was almost double that of the controls. Ethylene dichloride, applied by mistake for ethylene dibromide at rates of 2 and 4 ml. per linear foot, caused no reduction of galling and the growth of the plants was sparse.

Agr. 347 Timm, R. W. 1961. **Effects of root-knot nematode and lance nematode on growth of jute (*Corchorus capsularis* L.).** *Proc. 13th Pakistan Sci. Conf. Abs. Sec. Biol. B-5.*

Because of the constant association of two plant-parasitic nematodes with wilting jute plants, studies were made to determine the effects of these two nematodes on the growth of jute. All the experiments were carried out on *Corchorus capsularis* L., but there are good indications

from field observations that the same results may not apply to *Corchorus olitorius* L., which will be studied later. Root-knot nematode (*Meloidogyne javanica*) and lance nematode (*Hoplolaimus* sp.) were tested against jute in pots and under field conditions. The effectiveness of Nemagon as a soil fumigant was also tested. No wilting of any plants was observed, although heavy infections with root-knot and lance nematode resulted. Nemagon gave good protection against both root-knot and lance nematode, both in pots and in the field. Statistical analysis of fibre yields from control and infected plants was presented.

Agr. 348 Fakir, G. A. 1963. **Comparative pathogenicity of different isolates of *Colletotrichum corchori* Ikata and Yoshida of jute (IN Famir, G. A. 1963. Studies on the development of disease resistant varieties of jute with reference to anthracnose caused by *Colletotrichum corchori*). M. Ag. Thesis. Dac. Univ. (MS) 71 p.**

Fifteen isolates of *Colletotrichum corchori*, obtained from seeds or stems of 14 different capsularis varieties/strains of jute, collected at various Research Stations of the Pakistan Jute Research Institute, were compared for pathogenicity on the variety D-154. All the isolates were pathogenic to four weeks old seedlings. Of these, 13 isolates were moderately pathogenic, while the rest two were poor in pathogenicity.

Agr. 349 Fakir, G. A. and Q. A. Ahmed. 1965. **Inheritance of resistance in jute to anthracnose (*Colletotrichum corchori*). *Phytopathol.* 55 (7) : 749-751.**

Two jute varieties (*Corchorus capsularis* Rangamati wild and C-3) were crossed : Rangamati wild was resistant and C-3 was susceptible to anthracnose caused by *Colletotrichum corchori*. All F₁ plants were resistant, showing dominance of resistance over susceptibility. In F₂, a-3 resistant : 1 susceptible ratio was observed, indicating a monohybrid mode of inheritance. F₃ plants raised from the selected F₂ resistant population segregated in the ratio of 5 resistant : 1 susceptible, thus confirming monogenic inheritance of anthracnose reaction.

Agr. 350 Diswas, A. C., M. Q. Kabir and Q. A. Ahmed. 1968. **Differential response of wild species of jute to stem-rot causing organism *Macrophomina phaseoli*. *Proc. 20th Pakistan Sci. Conf. Abs. Sec. Biol.* C-49.**

An investigation was carried out to study the comparative resistance in some wild species of jute against *Macrophomina phaseoli*. The present observation was made under green house condition. Altogether 9 species of wild jute viz., *C. acutangulus*, *C. aestuans*, *C. trilo* (Sind), *C. irilo* (Cal), *C. trilo* (Africa), *C. siliqueous*, *C. fascicularis*, *C. hirtus* and *C. pseudo*, olit were sown in pots and artificially inoculated with *Macrophomina phaseoli* (Strain No. 155) at two different stages of growth, before flowering and after flowering. The infected zones were measured in mm. division. It was found that *C. acutangulus* and *C. aestuans* were comparatively resistant, and *C. hirtus* was proved susceptible.

Agr. 351 Islam, N. and Q. A. Ahmed. 1968. **Comparative effectiveness of a few seed-dressing fungicides against seed-borne diseases of jute.** *Proc. 20th Pakistan Sci. Conf. Abs. Sec. Biol. C-49.*

Eight fungicides were screened out. Only Granosan M (0.2%), Agrason 5W (0.2%), Mergon (0.2%) and Metasol (0.2%) were effective. Untreated seeds when planted on PDA medium showed 62% affected seeds same seeds when treated, reduced the number from 62% to as low as 4%. In green house soil pot experiment watering followed immediately after sowing of treated seeds in general reduced that stand of healthy seedlings in comparison to the pots where watering was delayed till 48 hours after sowing.

Agr. 352 Malek, A., N. A. Wadud Mia. 1968. **Effect of Gamma radiation on the fungi associated with seeds of *Corchorus capsularis*.** *M.Sc. (Ag.) Thesis. East Pakistan Agr. Univ. (MS). 51 p.*

Seeds of *Corchorus capsularis* were exposed to 40, 60, 80, 100 and 120 kr gamma radiation from Co. source. The highest percentage of germination was obtained with seeds exposed to 100 Kr. followed by 120, 80, 60, 40, and 00 Kr. Seedlings in the irradiated series developed abnormalities like chlorosis and stunting. Irradiated seed lots showed lesser pre-emergent and higher post-emergent death than the non-irradiated seeds. Progressively higher post-emergent seedling mortality corresponding to higher doses of radiation exposure suggested deleterious effects on treated seeds. Plating non-irradiated seeds on PDA yielded : *Macrophomina phaseoli*, *Botryodiplodia theobromae*, *Colletotrichum corchori*, *Glomerella cingulata*, *Fusarium solani*, *Aspergillus flavus*, *A.niger*, *A. fumigatus*, *Penicillium janthenellum*, *P. nigricans*, *Alternaria* sp., *Curvularia* sp., *Pestalotia* sp., *Mucor mucor mucedo*, *Rhizopus stolonifer* and *Chaetomium* sp. Recovery of fungi was less from the irradiated seeds due to adverse effect of gamma rays on the fungal contaminants. Maximum inactivation of these contaminants occurred at 120 Kr. Exposure to gamma rays considerably retarded the growth of *M. phaseoli*, *B. theobromae*, *G. cingulata*, *C. corchori* and *F. solani*. Irradiated cultures also developed other morphological abnormalities.

Agr. 353 Ahmed, H. U. and Q. A. Ahmed, 1972. **Studies on the comparative tolerance of two cultivated species of jute to wilt disease caused by *Rhizoctonia solani* Kuhn.** *Nucl. Sci. Appl.*, 6 (A) : 57-58.

Varieties C. G. of *Corchorus olitorius* and D-154 of *C. capsularis* were susceptible to wilt disease caused by *Rhizoctonia solani* Kuhn at their early stage of growth. At the adult stage, C. G. was found susceptible but D-154 resistant. Anatomical studies revealed that D-154 plants developed periderm layers from an early stage and consisted of 3-4 layers, while 1-2 layers of periderm were found in C. G. at very late stage of growth.

Agr. 354 Ahmed, M. U. and Q. A. Ahmed. 1972. **A preliminary report on the physiologic specialization in *Rhizoctonia solani* Kuhn, causing foot-rot wilt of jute, *Corchorus* spp.** *Pakistan J. Sci.* 24, (5-6) :

A total of 24 isolates plants of jute and from a few other host plants, were grouped into 10 different cultural races on the basis of their colony characters. From the study of virulence of these ten races to ten varieties of jute it was found that the races behaved differently to different varieties. Race R-1 appeared highly virulent while two varieties of jute, Lalsachi (*olitorius*) and Ctv. Scrimai gave either immune or resistant reactions to all the races.

Agr. 355 Ahmed, H. U. and M. Huq. 1973. **Disease reactions of atompat (jute).I. Stem rot, anthracnose and black band.** *Nucl. Sci. Appl.* 7 :

Eight promising mutants of Deshi jute (*Corchorus capsularis*) namely C-36, C-38, C-26, C-28, C-30, C-33, C-11 and C-8 and the mother variety D-154 were tested against three pathogens such as *Macrophomina phaseoli*, *Colletotrichum corchori* and *Botryodiplodia theobromae* the causal organisms of stem rot, anthracnose and black band disease, respectively. All the mutants and the mother variety were susceptible to stem rot and resistant to black band. However, the length of lesion of stem rot disease in case of C-36, C-30, C-26 and C-8 was less than the mother variety. All of them except C-31, which was intermediate in reaction, were resistant to anthracnose.

Agr. 356 Haque, M. A., S. N. A. Chowdhury and Q. A. Ahmed. 1973. **Physiologic specialization in *Botryodiplodia theobromae*, the causal organism of black band disease of jute. *Corchorus* species.** *Bangladesh J. Bot.* 2 (1) : 83- 93..

Twenty-eight isolates of *Botryodiplodia theobromae*, plated out from diseased seeds and stems of jute, were grouped as nine cultural races from their colony characters. To study their virulence on twenty-five jute varieties, one selected isolate from each cultural group was used. From the disease reactions given to nine cultural races by the twenty-five varieties of jute, it was found that only six varieties could differentiate the isolates. The six varieties thus could be designated as differential varieties and nine cultural races as physiological races.

Physiology

Agr. 357 Chaudhuri, S. D., D. H. Khan and A. M. Ibrahim. 1962. **Fibre quality of jute crop grown under different soil conditions.** *Proc. 14th Pakistan Sci. Conf. Abs. Sec. Agr.* A-48.

A work is undertaken to find out any possible relationship on a broad basis between soil properties and fibre quality of jute crop under growers conditions. Some jute soil types were studied as confined to two alluvial soil tracts, namely, Brahmaputra alluvium and Teesta silt. Physical analysis for particle-size distribution was carried out to determine the textural make up following Marshall's triangular coordinates. Ultimate fibre measurements were done by standardized chemical treatments followed by microscopic analysis. Fibre measurement data, computed as average for two alluvial soil tracts under study, showed markedly higher fibre quality (i.e. greater fibre length and lower fibre breadth) of jute crop grown in Brahmaputra alluvium soils. This experimental finding has been in agreement with the empirical observation that best commercial quality jute is grown in 'jat' area (which fairly corresponds

with the Brahmaputra alluvium). On textural basis, however, silty clay loam soil types in Brahmaputra alluvium seemed to have yielded jute crop containing larger fibre. Comparative evaluation of the chemical properties of the soil types in Brahmaputra alluvium tract is under indicate that jute crop grown in silty loam soils contained ultimate fibres of greater length than that grown in loam soil types. Nutrient chemistry of Teesta silt soils showed that silty loam soils have a better nutrient status than loam soils, and contained higher proportion of organic matter, total nitrogen, and available phosphate.

Agr. 358 Ali, M. M. and S. D. Chaudhuri. 1963. **Studies on the shamla(dark colour) colour of jute fibre.** *Pakistan J. Biol. Agr. Sci.* 6 (1) : 24-30.

In an investigation of the effect of certain fruit extracts, certain fungal culture filtrates and certain acids on the shamla colour (dark colour) of jute fibre, it was found that all the materials tested favourably changed the shamla colour of the fibre. However, their effect on the tensile strength of the fibre varied. The possibility of using the relatively better material among the tested ones in an industrial scale was discussed.

Agr. 359 Ali, M. M. and A. Rahman. 1965. **Acceleration of jute retting by *Bacillus cerfus*, certain chemicals and straw-water-ratios.** *Proc. 17th Pakistan Sci. Conf. Abs. Sec. Agr. A-15-16.*

In East Pakistan jute fibres are separated from the jute plants (*Corchorus capsularis* and *C. olitorius*) by a biological method known as retting. According to this method the defoliated jute plants are steeped under water for a certain length of time during which the enzymes of the micro-organisms of the water under the influence of its chemical propertis and temperature hydrolyze the pectic substances cementing the fibre strands in the green jute plants, and as an result the fibres are separated. This investigation was undertaken to study if an addition of an isolated retting bacterium or any particular chemical to the retting water or any alteration of the proportion of jute plants and retting water (Straw-Water-Ratios) could accelerate the retting speed. It was observed that the bacterium identified by us as *Bacillus cereus* accelerated the retting of jute alone as well as jointly with the other microorganisms commonly present in water. The common retting water contained certain nutrients which favoured the growth of retting microbes. Of the several chemicals tested, the chemical, urea when added to the retting water accelerated the speed of retting and improved the quality of fibres. Among the different proportions of retting water and the jute quantity tested the proportion of 600 ml of water and 50 gms. of jute stems gave the best result.

Agr. 360 Siddique, M. A. H. 1966. **Propagation of the tops of *Corchorus capsularis* plants by some growth regulators for seed development.** *M.Sc. (Ag.) Thesis. East Pakistan Agr. Univ. (MS).* 90 p.

The investigation was carried out in the laboratory, in the green house compound and in the experimental plots of central Jute Research In state, Dacca, during the years 1965-1966. Results revealed that Seradix treatment will be more economic and planting yield was

maximum. The success by this method was higher. The direct planting technique for the vegetative propagation of jute plants for seed may be recommended for the jute growers and no further investigation on the rooting of tops by growth regulators is recommended.

Agr. 361 Sarkar, M. R. A. and S. H. Chowdhury. 1967. **Studies on the behaviour of rooting of stem cuttings of jute as influenced by the growth substances and their effect on subsequent yield.** *M.Sc. (Ag.) Thesis. East Pakistan Agr. Univ. (MS). 110 p.*

The experiment was conducted to explore the possibility of obtaining both quality fibres and large quantity of seeds from the same plant by the vegetative propagation of top cuttings of two cultivated species of jute under the influence of growth substances like Beta-indolylacetic acid and Alphanaphthaleneacetic acid. The results, however, indicated that the growth substances at suitable concentrations such as 10 ppm. enhanced the adventitious roots to appear earlier from the base of the cuttings and produced increased number of roots. The site of initiation of roots was found to be the pericyclic zone. The growth substances greatly influenced the percentage of survival, vegetative growth and the production of fruits of the plants grown from cuttings. But the control cuttings planted directly in the field on the average of both the species of jute gave increased quantity of seeds of jute gave increased quantity of seeds which suggest that the growers will be highly benefited for seed multiplication purpose if top cuttings are grown even without any pre-treatment with growth substances. The cuttings of *Corchorus olitorius* gave much higher quantity of seeds in comparison with those of *Corchorus capsularis*.

Agr. 362 Haq, M. G. 1968. **Effect of presowing cold and hot treatments on the growth and development of jute plants.** *M.Sc. (Ag.) Thesis. East Pakistan Agr. Univ. (MS). 76 p.*

Experiments were done in 1967 and 1968 under the Agronomy Division of jute Research Institute, Dacca, with D-154 and 0-4 seeds respectively to study the effect of low temperature and drought condition on the growth and flowering of jute plants. As regards vegetative growth no marked difference was found in respect of plant height, base diameter, number of leaves produced between vernalized and control plants. Seeds vernalized at 6⁰ and 10⁰C for 7 and 20 days produced significantly taller plants than control 1-3 weeks plants exposed to hog atmosphere at 104⁰F (40⁰C) for 8-15 days showed delay in flowering; the plants were taller than control.

Agr. 363 Hoque, M. A. and S. H. Choudhury. 1972. **Studies on the rooting behaviour of the standard stem cuttings of jute at various ages or the plants and the structural status of the basal portion of the stem cuttings.** *M.Sc(Ag.)Thesis, Bangladesh Agr. Univ.(MS).43 p.*

Rooting of the jute stem cuttings *C. capsularis* and *C. olitorius* was studied in the laboratory with the aid of different concentrations of growth substance at the various ages of the plants. It was observed that lower concentration influenced the root formation in the younger stem. But as the age of the plant increased, the higher concentrations of the growth substances were required for root production. From the study of the internal structure of the basal portion of

the stem cuttings it was found that there was no significant development of periderm at the 8½" below the tip with might prevent the initiation of adventitious roots even at the higher age. It was recommended that farmers may adopt the procedure of vegetative propagation of jute by which maximum quantity of seed and good quality fibre will be achieved.

Agr. 361 Khan, M. A. H. and M. Husain. 1967. **A study of the effect of day length on flowering of *Corchorus olitorius* L. jute.** M.Sc. (Ag.) Thesis. East Pakistan Agr. Univ. (MS). 62 p.

A photoperiodic experiment on four varieties of *Corchorus olitorius* L. jute was conducted at the Central Jute Research Institute, Dacca from 11 April to 30th November, 1969 with the daily solar illumination of 11½, 12 and 12½ hours coupled with 14, 21 and 28 days cycles in order to determine critical number of cycles of different day lengths suited to prolonged vegetative phase in one hand and reproductive phase on the other. From the observation it was interpreted that 14, 21, and 28 photoinductive cycles of 11½, 12 and 12½ hour light period respectively were sufficient to induce early flowering in all the test varieties of *olitorius* jute. Keeping a particular flower initiating day length constant it was observed that longer the number of cycles, under the preview of this experiment, lesser was the number of days required for blossoming. Plant height, stem thickness and number of leaves were significantly influenced by the flowering time, shorter the plant height thinner the base diameter and number of nodes at flowering as was observed due to shorter day lengths coupled with longer photo-periodic cycles. It was observed that 12½ hour day length with all the duration of exposures had no good effect on bearing habit of *olitorius* jute. Comparatively 11½ day length was superior to 12 hour day length for 21 and 28 day photo-periodic cycle.

Agr. 365 Bose, S. and G. C. Datta. 1973. **Effect of treatments of colchicine, dimethyl sulphoxide, ethylene glycol, hydroxylamine and triethanolamine in jute (*Corchorus capsularis* L.).** *Bangladesh J. Bot.* 2 (2) : 1-6.

Dry seeds of jute (*C. capsularis* var. JRC 202) were treated with 0.2% aqueous solution of colchicine, DMSO, EG, HA and TEA for 24 hours in each case. The control was kept in distilled water (DW) for the same length of time. No set pattern of effect could always be seen as regards data taken for a number of characters. Not a single seed germinated after colchicine treatment. Plants with bifurcation of stem were seen after DMSO, EG, HA and TEA treatments and wavy natured stems were seen originating from DMSO, EG, HA and TEA. Those with many branches were detected after treatment with these chemicals and also from DW treatment. Trifurcation of stem was detected only from HA treatment.

Agr. 366 Fattah, Q. A. and A. U. Mallik. 1973. **Physiology of jute plant I. Effect of photoperiodic treatments.** *Bangladesh J. Bot.* 2 (1) : 69-75.

Corchorus capsularis L. cultivar D-154 and two of its mutants, Atompat-5 and Atompat-22 were subjected to different photoperiodic treatment. The results indicated that the two mutants were different in their photosensitiveness to flowering. Atompat-5 was found to be

photoneutral while Atompat-22 was photosensitive. The critical light period of Atompat-22 was found to be different from that of the mother variety, D-154.

Miscellaneous

Agr. 367 Ali, M. K. 1961. **Effect of storage containers on the moisture content and viability of jute seeds.** *Proc. 13th Pakistan Sci. Conf. Abs. Agr. A-82.*

There was no difference in viability of jute seeds tested on dry and wet days but viability was affected by the containers in which the seeds were stored and the duration of storage. That is jute seeds stored in earthen vessel and gunny bag deteriorated within 9 months of storage while those kept in glass-jar and tin can retained the viability. The rate of loss of viability was greater in case of C. G. seeds than D-154 seeds, and in seeds stored in gunny-bag than those in earthen vessel. At the time of storage at laboratory room temperature jute seeds kept in gunny bag and earthen vessel contained 54 and 60 per cent of viable D-154 seeds and 31 and 24 per cent of C. G. seeds respectively. Very little difference was marked with seeds stored in airtight glass-jar and airtight tin-can. The results show that earthen vessel (without clay smearing) and gunny bags are not proper containers for keeping jute seeds in storage.

Agr. 368 Khan, D. H., A. M. Ibrahim, and Habibullah. 1961. **Morpho-chemical studies of some soil types under jute cultivation : Brahmaputra alluvium and Teesta silt areas.** *Proc. 13th Pakistan Sci. Conf. Abs. Sec. Biol. B-13-14.*

A reconnaissance study of the Brahmaputra alluvium and Teesta silt areas, where jute profusely grows in alluvial soil sediments borne by different river deposits, was made. Texturally the Brahmaputra alluvium soils are clay loam to sandy loam, whilst the Teesta silt soils seem to be lighter in texture. The extent of flood deposits is appreciable in the Brahmaputra alluvium considering the relatively low-lying physiographic situation of the area. Grey is the dominant colour in both the alluvial zones indicating the presence of organic matter and relatively minor occurrence of sesquioxide concretions. Organic matter is in a more intimate and decomposed state in Brahmaputra alluvium than in Teesta silt soils. Chemically the Brahmaputra alluvium soils as studied so far, show a pH value of 6.42 ± 0.4 and organic matter content of $0.79 \pm 0.45\%$ whilst in Teesta silt soils pH and organic carbon content are found to be 6.30 ± 0.3 and $0.59 \pm 0.30\%$ respectively. Particle-size distribution data fairly conform to the field findings on texture. Fibre yield data (average of two years) under cultivators' own condition, showed 15.30 mds/acre and 13.71 mds/ acre yield of *C. capsularis* in the Brahmaputra alluvium and Teesta silt respectively whereas, the yield of *C. olitorius* in these two alluvia was recorded to be 15.56 mds/acre and 13.71 mds/acre respectively. The higher yield of *capsularis*, in the Brahmaputra alluvium, and of *olitorius* in the Teesta silt are probably a function of soil moisture relationship, as the *capsularis* plants can extract soil nutrients much better under water-logged conditions than the *olitorius* plants.

Agr. 369 Mia, A. J. and S.D. Chaudhuri. 1961. **Gibberellin and jute plants : germination and early elongation of radicle.** *Proc. 13th Pakistan Sci. Conf. Abs. Sec. Biol. B-3.*

Plump jute seeds of *C. capsularis* var. D-154 were tested for germination and elongation of radicals treated with pure gibberellic acid. Concentrations used were 10.1 milligrams, 500, 250, 100 and 50 micrograms of gibberellic acid per litre of double dist. Water (glass water). No water other than double dist. water was used in this experiment. 'Tween 20' was used as wetting agent. Seeds were washed and dried before setting up experiment. Petridishes were tested in acid, washed, dried and sterilized at 15 lbs. with moist filter paper in each petridish. One hundred seeds per petridish (in 10 ml solution) were grown in dark for 24 hours. The temperature maintained was constant at $35 \pm 1^{\circ}\text{C}$ during the experiment. Immediately after each experiment was carried out, further GA-effects on radicle elongation was stopped by washing the seeds thoroughly. Twenty-five radicles taken at random for each replication were measured in millimeter scale. The percentage of germination and radicle length were recorded from an average of 3 replications for each treatment. Gibberellic acid had apparent effects on jute seed physiology. Strong concentration of GA adversely affected the rate of germination and the growth of the radicles. At weak concentration beneficial effects of GA leading to 2.6 per cent higher germination and 2.6 mm more radicle growth than the control were recorded in 24 hours time.

Agr. 370 Ali, M. K. 1962. **Moisture content and viability of jute seed during storage.** *Proc. 14th Pakistan Sci. Conf. Abs. Sec. Agr. A-14.*

Jute seed deteriorates within a very short time if it is not properly stored. preliminary observations showed that seed stored in earthen vessel or gunny bag lost viability in 6 months, while in airtight containers it remained fresh as long as 3 years. With a view to finding out the causes of this deterioration D-154 and C. G. seeds harvested in November 1960 were stored at room temperature in various containers such as ordinary bamboo basket, clay-smeared bamboo basket, ordinary earthen pot, cement-smeared earthen pot, oil-smeared earthen pot, gunny bag, polyethylene bag, polyethylenlined gunny bag, airtight glass jar, and air tight tin can. Samples were taken before storage and at intervals during storage for determination of moisture content and germinability of seed. Germination was done in an incubator at 31°C and moisture content was tested in a 'CENCO' moisture balance at 100°C . At the time of storage D-154 and C. G. seeds had 95% and 85% viability the respective moisture content was 10.9% and 10.6%.

Agr. 371 Ali, M. A. 1962. **Performance of jute plants grown from old seeds.** *Proc. 14th Pakistan Sci. Conf. Abs. Sec. Agr. A-13.*

There are regular complains from growers that jute plant grown from old seed flowers prematurely, remains stunted and thereby reduces the yield of fibre. To investigate into the effect fresh and old seeds of *capsularis* and *olitorius* on the growth and development of plants D-154 and C. G. varieties were grown at Taranto in 1960 and at Dacca in 1960 and 1961. No difference in height, thickness, date of flowering and yield of fibre was observed in plans

grown from either old or fresh seed. Regardless of location and year of growing *capsularis* plant grown from 1 year old seed was 6.38 ft. tall and 17.94 mm thick at the time of flowering and that from fresh seed was 6.30 ft. tall and 18.20 mm thick. In case of *olitorius* the height and thickness were 7.61 ft and 14.29 mm respectively in old seed and were 7.52 ft. and 13.36 mm in fresh seed. D-154 and C. G. plants from old seed flowered on August 14 and August 11, but the respective date of flowering was August 11 and August 7 in fresh seed. The fibre weight when calculated on per plant basis showed no significant difference between treatment, however lower per acre yield in old seed was attributed to poorer plant stand which could be compensated by adjusting the seed rate per acre on the basis of germination percentage.

Agr. 372 Ali, M. K. and M. N. Huda. 1965. **Performance of 1 year and 2 years old seed of *C. capsularis* (jute) varieties.** *Proc. 17th Pakistan Sci. Conf. Abs. Sec. Agr. A-17-18.*

In spite of previous works done by Ali (1963) and Chaudhuri (1952) on the performance of 1 year old seeds of two important varieties of jute, namely, D-154 and C. G., the agricultural workers of this province hesitated in recommending the use of old seeds for sowing purposes lest the plants flower prematurely. It was, therefore, felt that further tests should be done with more than 1 year old seeds of a few varieties of jute. In the present experiment, 1 year and 2 years old seeds of 3 important varieties of *capsularis*, which occupies about 75 per cent of jute acreage, were included. New seed was treated as control. With a view to studying the problem intensively, from seedling stage to maturity, trials were given under laboratory, pot and field conditions. From the findings it can be definitely said that suitably preserved old seeds of *capsularis* will not be inferior to new seed in any respect and they may be profitably used for sowing in the field.

Agr. 373 Mia, M. M. and M. A. Aziz. 1965. **Modified haematoxylin stain technique of smear preparation of jute.** *Proc. 17th Pakistan Sci. Conf. Abs. Sec. Agr. A-17.*

For the study of mitosis of jute with root tips, fresh roots from germinated seeds of the variety D-154 of not less than 1-25 cm in length were prefixed in paradichlorobenzene (an over saturated solution in distilled water) for 20 minutes. After that the material was washed in water for several times as long as there was smell of paradichlorobenzene. Changed in 30%, 50% and 70% alcohol keeping for 5 minutes in each grade. Then the material was fixed in Formalin Acetic Alcohol comprising of 2 parts of commercial formalin, 3 parts of glacial acetic alcohol and 10 parts of 70% alcohol and kept for 30 minutes. Hydrolysis in 50% HCl for 30 minutes was found suitable. Washed transferred in 3% Iron Alum and kept for 5 minutes. Washed again in running water to remove the excess of Iron Alum. Changed in 0.5% haematoxylin and kept for 2 minutes. Washed again and smeared the tip of the root in 0.25% Aceto-carmin. This method was found equally effective in other plant materials such as paddy, onion and maize.

Agr. 374 Sarder, M. M. I. and M. M. Hussain, 1966. **A study of ultimate fibres of different wild cultivated species of the genus *corchorus*.** *M.Sc. (Ag.) Thesis. East Pakistan Agr. Univ. (MS).* 89 p.

To study the ultimate fibres of jute, forty different types of *corchorus* were considered for the present investigation carried out in the Botany Division of the Jute Research Institute, Dacca. They comprised of local and exotic *capsularis*, and wild types, Statistically different cell-sizes at bottom, middle and top of the same plant was observed. Longest and shortest fibre cells were always associated with the top and bottom portions respectively of all the types of all the species and at all stages of harvest. The ultimate jute fibres at all the three portions of plants grew with age, although the growth rate was not same in all the types and at all the three portions. Maximum number of bundle-masses, bundle apetchs-and ultimate fibres were always observed at the basal portion and minimum at the top of plants of all the species studied. In *olitorius* there are more bundle-masses, bigger bundle-patches and more ultimate fibres per patch and also per mm. of stem diameter. Fuleswari and BZ-3 of *capsularis* ECY/576 and Bomb Japan of *olitorius* and *corchorus acutangulus* and *corchorus pseudo-olitorius* of wild types have been observed to posses desirable fibre length breadth and length-breadth ratio at the three portions and at the three stages of harvest.

Agr. 375 Ali, M. K. 1968. **A new technique for propagation of jute plants by leaf cuttings.** *Proc. 20th Pakistan Sci. Conf. Abs. Sec. Agr. A-78.*

Plants may be propagated vegetatively by means of stem, leaf, and bud and root cuttings. in many cases these methods are easier, more economical and more reliable for rapid multiplication of a plant. Except a few thick, freshly leaved ornamentals such as bryaphyllum, begonia, African violet, gloxinia and sansivieria, leaf cuttings are very rarely used for propagation of field crops, although it had been reported that the technique of culturing detached leaves were very useful for studies of transpiration, respiration, photosynthesis, protein synthesis, and for the culture of insects and plant pathogens. In jute, the technique for multiplication of plants by top cutting which was developed by the author in 1960, has recently been greatly improved for large scale production of quality seeds by the farmers. Since it was not known whether jute plants could be propagated by leaf cuttings, the technique as mentioned herein may be treated as a new finding of Jute Research Institute.

Agr. 376 Rahman, A. and M. Hussain. 1969. **A study on the correlation between total yield of fibre and some anatomical characters of *Corchorus capsularis* L.** *M.Sc. (Ag.) Thesis. East Pakistan Agr. Univ. (MS).*

To study the correlation between the total fibre yield of jute and certain anatomical characters of D-154, c-1, c-4, and c-6 varieties of *Corchorus capsularis* L. was considered for the present investigation. Number of pyramids per section was highest in the variety D-154, whereas the number of pyramids in c-1, c-4, and c-6 were more or less comparable. Average thickness of bark and size of pyramids were highest in the variety c-1 followed by c-6, c-4, and partly D-154. The variety c-1 had a very broad periderm, D-154 had the thinnest ones and

the other two were intermediates. Total fibre yield per stand was highest in D-154 followed by c-1, c-6 and c-4. Statistical analysis showed highly significant positive correlation between the fibre yield and number of pyramids, thickness of bark, size of pyramids and total area covered by the pyramids in a section. From the value normal deviate of these four characters it was found that the total area covered by the pyramids in a section had the highest correlation value with total fibre yield. This single character is recommended for screening individual plants from a heterogeneous population.

Agr. 377 Mia, M. S. and M. Hussain. 1969. **A study on the relationship between the number of leaves formed and retained therefore at flowering stage with fibre yield of *Corchorus capsularis* L.** M.Sc. (Ag.) Thesis. East Pakistan Agr. Univ. (MS). 72 p.

The study was conducted with four varieties of *Corchorus capsularis* viz. : D-154, C-1, C-4 and C-6 at the Jute Research Institute, Dacca in 1967-68 season. The purpose of the study was to find out (a) whether the number of nodal leaves formed and the number of leaves retained therefore till flowering has any bearing with the fibre formation, (b) whether the number of nodal leaves retained is more correlated with the percentage of fibre in relation to green weight. The correlation coefficient value between (a) number of leaves formed and fibre weight, (b) number of leaves retained and fibre weight and (c) number of leaves retained and percentage, were highly significant at 1 per cent level which indicated that all the three characters considered in this study were closely interrelated. The 'Z' transformation value between leaves formed retained vs. fibre weight was not significant which indicated that any one character can be considered in case of selection. It was proposed that only the number of leaves retained should be counted at the time of selection of jute plant from a heterogeneous population of *Corchorus capsularis* L.

Agr. 378 Molla, A. W. and M. Hussain. 1969. **A study on the correlation between average leaf area and fibre yield of jute, *Corchorus olitorius* Linn.** M.Sc. (Ag.) Thesis. East Pakistan Agr. Univ. (MS). 74 p.

Four *olitorius* hybrid progenies O-9896, O-9897 and O-9898 were considered as test materials due to their like percentage and similarity in plant height, base diameter and time of maturity. The experiment was conducted at Jute Research Institute, Dacca to find out the correlation, leaf area in one side and (i) fibre content and (ii) percentage of fibre in relation to green weight on the other. It was observed through Turkey's W-procedure that the hybrids did not differ statistically in the traits of plant height, base diameter and maturity. Highly positive correlation with leaf area was observed both for fibre content and fibre percentage in all the hybrids and their parents. The study pointed out that leaf area was a very sound character to consider for the selection of *olitorius* jute plants from a heterogeneous population.

Agr. 379 Ali, M. A. 1971. **Preliminary observation of yield and strength of jute fibre and blends with *sanpat* and silk fibres.** *Sci. Ind. (MS No. 24)* :

In order to ascertain the effects of common chemical fertilizers and plant population densities on the crop yield and strength of jute fibre, 24 different samples have been grown in natural conditions. Whilst urea may increase the crop yield at the cost of fibre strength, potash and phosphate appear to make up the loss of fibre strength. Interplant competition for fibre substance and solar energy may determine optimum plant population density for maximum crop yield. The yield, which depends on the amount of fibre per plant rather than the density of plant population, is correlated with the coefficient of variation of bundle tenacity. The reduction of tenacity exhibited by various fibre blends has also been cogently explained.

Agr. 380 Awal, A. and A. Haque, 1972. **Study of karyotypes of some *Sesbania* species using a new and more efficient cytological technique.** *M.Sc. (Ag.) Thesis, Bangladesh Agr. Univ. (MS). 25 p.*

Mitotic studies were made in three species of the genus *Sesbania* namely *S. aegyptiaca* Pers., *S. grandiflora* Pers., and *S. aculeata* Pers. *S. aegyptiaca* is a diploid species with the chromosome number $2n = 12$. The remaining two species namely *S. grandiflora* and *S. aculeata* are both tetraploids having $2n = 4x = 24$. It is thus evident that polyploidy has been effective as instrument in the evolution of the genus *Sesbania*. The detailed karyological observations showed that there were two pairs of satellited chromosomes in the species *S. aculeata* and only one pair in each of the other two species. The single pair of the satellited chromosomes present in the two species has got its traband attached to the longer arm in *S. grandiflora*. Of the two pairs of satellited chromosomes in *S. aculeata* one pair has its traband attached to the longer arm arrangement the other pair attached to the shorter arm of the chromosome. The morphology of the chromosomes of the three species showed that the karyotype of any one of these species is dissimilar to any other of the species. The observation on the long arm : short arm (L/S) ratio gave dissimilar figures for chromosomes within the species as well as between the species. The investigation showed that the basic number of chromosomes in genus *Sesbania* is $x = 6$.

Agr. 381 Ali, M. M. and S. Alam, 1973. **Effect of different pH values on jute retting.** *Bangladesh J. Bot. 2 (1) : 19-23.*

In an *in vitro* study of the effect of different pH values of retting water on jute retting, it appeared that the retting did not progress at all if the pH values of the retting water were adjusted to 5 or below. At higher initial pH values, such as, 9 and 10 the retting was not impaired provided they were not buffered. These higher unbuffered pH values however gradually fell down to 7 when the retting was complete. The retting progressed favourably at unbuffered pH values of 7, 8, 9 and 10, if the pH values were not made to stay at constant values with the help of buffered solutions but were allowed to fluctuate, the retting progressed better.

Cotton

Agr. 382 Alm, M. Z. 1962. **Insect pests of common in East Pakistan.** *The Pakistan Cotton.* 7(1):

A survey of cotton pests were undertaken during the period from 1956 to 1961 and 27 different insect pests have been recorded. Nature of damage and parts affected by each species has been indicated. The status of each pest has been enumerated. Biological information and life history of each pest have been described.

Agr. 383 Alam, M. Z. and A. Hoq. 1964. **On the biology of cotton mealy bud, *Pseudococcus virgatus* Cockral (Coccidae : Hemiptera) in East Pakistan.** *Res. Rep. Div. Entomol.*

The Cotton mealy bug, *Pseudococcus virgatus* Cockral is a serious pest of cotton in East Pakistan. It is also a major pest of jute and citrus plant. From 1962 to 1963 some studies on its biology were conducted. The distribution of the pest in East Pakistan has been enumerated. The feeding habits, nature and extent of injury have been stated. The different stages along with their external morphological characters have been described. Seasonal cycles have been stated. Natural enemies are recorded and their effect on the pest has been enumerated.

Agr. 384 Hossain, M. G. and S. M. Hasanuzzaman, 1967. **A study on the induced auto-tetraploid Comilla Cotton and its F₁ hybrid with American Upland Cotton.** *M.Sc. (Ag.) Thesis. East Pakistan Agr. Univ. (MS). 94 p.*

In order to avoid sterility in F₁ crossing between Comilla Cotton (*Gossypium arboreum* race *cernuum*, n = 13) and Upland Cotton (*G. hirsutum* n = 26) was made keeping both the parents at tetraploid level. For this, chromosomes of Comilla Cotton was doubled by the application of colchicine and the resulting autotetraploid plants (4n = 52) were crossed with normal Upland Cotton. The autotetraploid plants of Comilla Cotton showed greater plant height, dark green and thickened leaves, larger stomata and pollen but were comparatively male sterile mainly due to failure of dehiscence of anthers. However, when used as female parent, the 4n plants crossed readily with Upland Cotton. Cytological observations in plants showed highly irregular synapsis of chromosomes due to formation of quadrivalents. Abnormalities were also observed in separation of chromosomes and in the formations laggards. The morphological features of F₁ plants showed hybrid vigour in plant height, number of branches per plant and size of leaf, size and colour of flower and number of leath in each bracteole were intermediate between the parental forms. Meiosis in F₁ Plants was highly irregular often forming tri- and univalent in addition to quadrivalents. Observations on megaspore in F₁ plants showed normal embryo sac.

Agr. 385 Alam, M. Z. 1968. **Record of parasites on cotton pests.** *Annu. Rep. Div. Entomol.*

During the survey of cotton pests their parasites were also recorded from the cotton of Dacca Farm. They are listed with families and orders and nature of parasitization.

Agr. 386 Chodhury, S. A. and S. M. H. Kabir. 1970. **Stem application of insecticides for control of the red cotton bug, *Dysdercus koenigi* (FB.).** *Pakistan J. Sci. Ind. Res.* 13 (1 & 2) : 88-90.

A green house test was conducted for determining the effectiveness of selected systemic insecticides, Azodrin (3-hydroxy-N-methyl-cis-cortonamide dimethyl phosphate), Bidrin (3-(dimethoxy phosphinyloxy)-N, N-dimethyl-cis-cortonamide) and Dimecron (2-chloro-2 diethylcarbamoyl-1-methylvinyl 1-dimethyl phosphate) against the red cotton bug, *Dysdercus koenigi* (Fab.). The insecticides were applied in acetone to the stem of the plant, *Hibiscus esculentus* Linn. at the rate of 2.5, 5.0 and 10.0 mg/plant. The 10 mg/plant dosage approximated 1.0 lbs. active material per acre. All the three insecticides were quite effective in controlling the bugs. The nymphs were, however, more susceptible than the adults.

Agr. 387 Kabir, S. M. H. and S. A. Choudhury. 1970. **Toxicity of some insecticides to the red cotton bug, *Dysdercus koenigi* (FAB).** *Pakistan J. Sci. Ind. Res.* 13 (4) : 403-404.

The LD₅₀ values and relative toxicity of five organophosphorus insecticides, Azodrin, Bidrin, Birlave, and Dimecron were determined by topical application to the third instar nymph and adult of red cotton bug, *Dysdercus koenigi* (Fb.). Azodrin and bidrin were found to be most toxic to the nymph and adults respectively. The nymphs were comparatively more susceptible to the insecticides tested.

Ramie

Agr. 388 Ali, M. I. and M. M. Badruddoza. 1962. **Effects of some growth regulators on root and shoot development of ramie plants.** *Proc. 14th Pakistan Sci. Conf. Abs. Agr.* A-64.

Some of the effects of plant hormones or growth regulators on the ramie (*Boehmeria nivea*) plants were studied at the Agricultural Experiment Station, Tejgaon, Dacca. The experiment was carried out mostly in the pot culture; some of the studies, however, were made in the laboratory. In the present experiment, the effects of "seradiz A" and "planofix" as root inducing hormones and gibberellic acid as a growth regulator, upon ramie plants were observed. Two varieties of ramie, Indonesia and Zokazi, were used in different studies. It was noticed that the treated plants increased more in length per week than the control, and this increment was maximum in the third and the fourth weeks and slowed down later on. It was further observed that the gibberellic acid induced the ramie plants to flower earlier than the control only at lower concentrations (10 and 25 p.p.m.); the higher concentrations (50 and 100 p.p.m.), on the other hand, delayed the flowering habit. The yield of dry fibre from the treated plants was higher than untreated ones; the yield was found to increase as the concentration of

the chemicals was increased. The yield from the use of 1000 ppm gibberellic acid was the best of all treatments and it was 185.50% higher over the control.

Agr. 389 Aziz Miah, M. A. and S. M. Hassanuzzaman. 1966. **A study on the developmental anatomy of the fibre formation of ramie (*Boehmeria nivea* L.).** *M.Sc. (Ag.) Thesis. East Pakistan Agr. Univ. (MS). 53 p.*

The investigation was carried out to determine the development of fibre in Ramie (*Boehmeria nivea* L.) at different stages of growth so as to ascertain the actual time of harvest toward maximum yield of fibres. Two varieties, viz., Hakuhsu and Indonesia, were included in this study. The study was undertaken at the Agricultural Reserch Institute Farm, Dacca in May 1965. The study was mainly concentrated to the development of fibre. viz., differentiation of fibre cell, characteristics of fibre cell and their number at different stages of growth and the rate of formation of fibre cells. Primary and secondary fibre cells initiated their development from protophloem as well as secondary phloem elements of each variety. The young fibres had their hyaline membranes intervened by their walled parenchymatous cells. The ends of the cells were rounded off instead of being spindle shaped. As long as 58 mm fibre cell was obtained on maceration, the cell wall represented more than one lamellae. The rate of growth was higher in the initial stage of development and gradually became lower at mature stage. The number of fibre cells varied greatly at different stages of growth. The variety Hakuhsu gave maximum number of fibre cells with greater thickness of cell wall than that of Indonesia. Moreover, Hakuhsu matured earlier than the variety Indonesia.

FOOD CROPS

Rice

Breeding

Agr. 390 Jalil, M. A. and H. Yamaguchi. 1964. **Experiments on the induction of polygenic mutations with successive irradiation in rice.** *Phyton* 21 (2): 149-155.

The comparative effects of single and successive irradiation and the latter with and without selection were studied on the induction of mutations for quantitative characters (grain size) in rice. Where selection had not been applied, the mean values for grain size decreased due to successive irradiation and particularly in breadth the decrease was found to be highly significant. The frequency distribution of all the populations fitted the expected normal curve. Successive irradiation accompanied by selection shifted the mean values towards the desired direction both in long and short grains and increased the variability significantly. The frequency distribution of all the populations was found to fit the normal distribution curve except $X_{2/4-10-S}$ which was skewed in a negative direction in relation to the mean.

Agr. 391 Yamaguchi, H. and A. J. Miah. 1964. **Mutational mosaics induced by X-, Gamma-rays and ethylene imine in rice.** *Radioisotopes*. 13 (6) : 472-476.

The comparative effects of ionizing radiations (X-and Y-rays) and ethylene imine of relatively low doses were studied, using dry seeds of variety Kinmaze in rice. There was a linear relationship between mutation frequency and the dose of X- and Y-rays, and a significant difference of the mutation yield was not found within the two types of radiation used. For the materials irradiated with sufficiently low dose and treated with ethylene imine, the segregation ratios in X_1 -ear-branch showed a strong deficit of recessives. With higher, the segregation ratios came nearer to the expected ratio of 0.25. The results are interpreted to indicate that two types of mutation, fractional and whole, are produced by mutagenic agents.

Agr. 392 Khan, S. H. and S. H. Chowdhury. 1965. **Cytogenetical studies in some rice varieties (*Oryza sativa* Linn.) and their F_1 hybrids.** *M.Sc. (Ag.) Thesis. East Pakistan Agr. Univ. (MS)*.

The purpose of the study was to find out the effect of inter-varietal hybridization on the phenotype and Karyotype of the offspring and to interpret the result on the basis of influence of genus and chromosome behaviour meiotic and division on the Karyotype behaviour on morphogenesis. Four Aus varieties of *Oryza sativa* namely Dharial, Panbira, Marichbeti, and Hashikalmi were used for the study conducted at Agricultural University, Mymensingh. The hybrid of Hashikalmi and Marichbeti showed certain percentage of pollen sterility and irregular meiosis. Regular meiosis was also observed in other hybrids. The origin of the sterility in the F_1 hybrids was not due to unfavourable gene combinations but due to a structural hybridity for inversion. The chiasma frequency per bivalent was reduced in all the

hybrids studied showing a slight reduction in the homology between the chromosomes of the four varieties. Secondary pairing behaviour was observed in every P. M. C. of both parents and hybrids. The mean number of associating per cell was more or less the same in the parents as well as in the hybrids showing that the pattern of secondary association was not altered by hybridization. Thus, on the basis of maximum pairing observed, the primary basic chromosome number of *Oryza sativa* Linn. as $n = 2$.

Agr. 393 Miah, A. J. and H. Yamaguchi. 1965. **The variation of quantitative characters in their radiated progenies of two rice varieties and their hybrids.** *Radiat. Bot.* 5 : 187-196.

The effects of irradiation with Y-rays on the genetic variability of quantitatively inherited economic characters in pure varieties and hybrid populations of rice were evaluated. Dry seeds of both Kinmaze and Sasashigure and F_1 seeds of Kinmaze X Sasashigure were exposed to Y-rays from a Co^{60} source. To study the variability in the X_3 generation, a space-plant row from each X_2 plant was grown in the field, where a randomized block design was laid down with two replications. Data were recorded for several quantitative characters of individual plants. For the X_4 generation, two plants were chosen at random from each of the five highest yielding progenies from each population. The experiment was repeated four times in the field. Frequency distribution of all the characters for the control and each of the X_3 populations were fitted to the expected normal distribution curve. Analyses of variance of the data indicated that the radiation treatment increased variances in most of the characters while the mean value of each treated population was almost the same as that of non-treated population. It was assumed that mutations for most of the quantitative characters occurred symmetrically in plus and minus directions. The data of the X_4 experiment indicated that one line appeared towards the higher yielding side of the histogram for the irradiated hybrid, while one line appeared towards the lower yielding side of the histogram for control hybrid population. From this study it can be suggested that manifestation of mutated characters was modified by background genotype, and it was apparent that we could select more desirable variants by the irradiation of hybrids seeds in comparison to irradiation of the seeds of pure varieties.

Agr. 394 Miah, A. J. and H. Yamaguchi. 1965. **Variation in quantitative characters of X_2 plant after hybridization and irradiation in rice.** *Japanese J. Br.* 15 : 91-96.

The present paper describes some aspects of inducing genetic variation of polygenically controlled characters following the irradiation of two rice varieties and their hybrids. The data for the characters studied in X_2 generations were analyzed by appropriate analysis of variance. In all the cases, the mean value of the irradiated population with respect to grain size character was almost the same as that of the non-irradiated control, while the variance of the irradiated population increased on the other hand, for endosperm quality the irradiated populations showed increased in the mean value and the variance. The results obtained in the present experiment suggest that background genotypes played an important role in the manifestation of mutated characters.

Agr. 395 Miah, A. J., I. M. Bhatti and A. Ghafoor. 1966. **Studies on induced mutations in rice.** *Proc. Agr. Symp. Atomic Energy Centre. Dacca 1-6 p.*

Seeds of two rice varieties namely, Kangni-27 and Dokri Basmati were irradiated with different doses of gamma rays from a Co⁶⁰ source. In the X₁ generation germination percentage, seedling height and seed fertility were examined. The data indicated that Kangni-27 is more radio-resistant than Dokri Basmati. In the X₂ generation, two polygenic traits were studied. From the analysis of the data, it was found that variability was greater in the irradiated populations than in the non-irradiated controls. Apart from the study of the polygenic traits several mutants, which appeared to be useful from the breeders point of view, were isolated from the irradiated populations of Kangni-27.

Agr. 396 Yussouf, M. A. and A. Alim, 1966. **A study on the correlation between different yield contributing factors on Aus paddy.** *M.Sc. (Ag.) Thesis. East Pakistan Agr. Univ. (MS). 71 p.*

Two hundred pure Aus paddy strains were grown at Agricultural Research Institute Sub-Station, Jamalpur, Mymensingh to study the relationship between the different quantitative characters such as plant height, tiller number, panicle length, grain number per panicle, thousand grain weight, life cycle and yield per plant. However, the study revealed that the correlation between the characters were positive except that of between plant height and tiller number, tiller number and panicle length, tiller number and grain number per panicle and life cycle and tiller number. It can be concluded that there were significant correlations between the characters, such as, tiller number and yield per plant, grain number per panicle and yield per plant and plant height and tiller number. These interrelationships indicated that an increase or decrease in one of these related characters would change the magnitude of the other causing a proportionate increase or decrease in yield.

Agr. 397 Ahmad, A. and 1967. **A study on the correlation of the yield contributing characters of some selected IRRI rice strains grown as Aus crop in East Pakistan.** *M.Sc. (Ag.) Thesis. East Pakistan Agr. Univ. (MS). 123 p.*

The interrelationship between different yield contributing factors such as plant height, effective tiller per plant, panicle length, panicle weight, fertile grain number per panicle, one thousand grain weight, heading time, life span, and yield per plant of two hundred IRRI rice strains were studied during Aus season of 1966 at Rice Research sub-station, Comilla. Positive and significant correlations were observed between (a) plant height versus panicle length, fertile grain number per panicle, heading time and life span : (b) panicle length versus panicle weight, fertile grain number per panicle, one thousand grain weight and heading (c) panicle weight versus fertile grain number and one thousand grain weight : and (d) one thousand grain weight versus heading time. The following characters were found to have negative and significant correlations (a) plant height versus effective tiller, and yield per plant (b) effective number versus panicle length, and panicle weight (c) panicle weight versus life duration : (d) life span versus yield per plant. Hence from this study it was concluded that

partial or complete change in magnitude in any one of the quantitative characters of a strain would go a long way to influence the yield of that particular strain. The correlation study would be worth significant and helpful for selecting the best strains for future use in breeding programme.

Agr. 398 Huda, M. N. and S. H. Chowdhury. 1967. **Performance of some introduced varieties of rice in comparison with best local varieties.** *M.Sc. (Ag.) Thesis. East Pakistan Agr. Univ. (MS). 188 p.*

The experiment was conducted at the East Pakistan Agricultural University Research Area to compare the performance of two introduced varieties of rice IR9-60 and IR8-288-3 with four established local varieties viz. Bhasamanik and Latisail of Aman group and Habiganj VII and Habiganj VIII of Boro group, both in the pot and in the field. During Aman season, in the field Latisail was the maximum yielder of grain. The high yield contributing factors were maximum number of effective tillers, taller plant stature and maximum number of green leaves. In the Boro season IR8-288-3 produced the maximum yield grain which in the pot, contributed mainly by the maximum number of total spikelets, but in the field due to the longest panicle maximum number of total spikelets, and highest grain-straw ratio. In both the trials IR8-288-3 had the maximum average number of green leaves and maximum average effective green leaf area which might be regarded as the factors contributing to better yield. In general, the IRRI varieties had comparatively longer span of life in both Aman and Boro season when compared with local varieties. The life span of the IRRI varieties was 30-40 days more in the Boro season than that in the Aman season.

Agr. 399 Khan, A. L. and S. M. Hasanuzzaman. 1967. **Comparative morphological and anatomical studies of rice varieties in respect of resistance or susceptibility to blast disease.** *M.Sc. (Ag.) Thesis. East Pakistan Agr. Univ. (MS). 100 p.*

The experiment was conducted at the East Pakistan Agricultural Research Institute, Dacca in 1965 to make a comparative study of certain morphological, anatomical, and chemical characters of seventeen T. Aman rice varieties and to determine the association of these characters with blast disease caused by *P. oryzae* Cav. The morphological studies of leaf showed that mean length and the area of the 4th, and flag leaf blades had no influence on the disease reaction but the resistant and susceptible varieties generally had erect and droopy leaves respectively. In anatomical studies the number and size of the stomata of 4th and flag leaf blades were studied and it was found that the resistant varieties generally had lesser number of stomata at both seedling and mature plant stages than the susceptible varieties. The chemical analysis revealed that the resistant varieties had more silicon content, higher silicon-nitrogen ratio, and lower number of stomata than the susceptible varieties at both seedling and mature plant stages. Hence by counting the number of stomata of leaf and silicon content of the seedlings, one can quickly screen out varieties susceptible to blast disease.

Agr. 400 Rabbani, M. G. and M. S. Haq. 1967. **A study of the variations in some quantitative characters of autumn rice after hybridization and seed irradiation.** *M.Sc. (Ag.) Thesis. East Pakistan Agr. Univ. (MS). 43 p.*

The research was undertaken to evaluate the efficiency of irradiation and hybridization separately and in combination in autumn rice at the Atomic Energy Centre, Dacca. Data were collected on days to heading, plant height at maturity, number of tillers and number of effective tillers, grain yield, and 100-grain weight. Irradiation was found to increase variability in general for all the characters studied. But the combined effect of irradiation and hybridization was superior in inducing variability in the population specifically for grain yield character. Mean values in the irradiated parental population decreased except in the character days to heading. Irradiation of the hybrids increased mean values. The results of this work indicated that hybridization in combination with irradiation is superior to hybridization or irradiation alone in creating variability in quantitative characters of autumn rice.

Agr. 401 Razzaque, M. A. and S. M. Hasanuzzaman. 1967. **A study on the panicle development of clustered paddy.** *M.Sc. (Ag.) Thesis. East Pakistan Agr. Univ. (MS).*

One variety of paddy called Khejurjupi was selected to study the formation of clustering of spikelet on the panicle. It was found that the transformation of shoot apex to panicle primordia and subsequent development of first order branches of the panicle was normal. However, the internodes between two adjacent first order branches did not grow normally. The development of second order branches on the first order branches was characterized by suppression of growth of the internodes between two successive spikelets. Due to the suppression of growth of internodes of second order branches between several adjacent spikelets brought about a condition of clustering of spikelets at certain places of the first order branches because the second order branches did not develop at all. The compactness of the fact that there was suppression of growth of the pedicel of individual spikelets become sessile. Due to clustering of spikelets the sterility per cent varied from 8.33 to 21.31 which indicated a fair amount of spikelet sterility.

Agr. 402 Alam, A. 1968. **Breeding of rice for resistance to major diseases in East Pakistan.** *Proc. 20th Pakistan Sci. Conf. Abs. Sed. Biol. p. C. -53.*

An account of the culture of rice crops and steps taken for improvement have been stated. The diseases, so far observed to occur, have been described. Limited work, so far done, one varietal resistance has been described. It has been of very preliminary nature and mostly for screening the reaction of the diseases to the varieties. A couple of decade ago there were 3 diseases of rice, recognized, namely Helminthosporium disease, Nematode disease and stem rot disease which occurred in sizeable amount. In recent years however, a number of other diseases have been observed in great magnitude. They are namely blast, bacterial leaf blight, physiological diseases and viruses. It is high time that steps are taken to breed resistant varieties in order to stabilize the yield. The account of work on disease problems and varietal

resistance will reveal that work has just been started in this respect and it will be intensified in the near future.

Agr. 403 Hoque, K. R. 1968. **A comparative morphological and cytological study on the selected X₄ radiation induced mutants and their normal parents.** *Proc. 13th Pakistan Sci. Conf. Abs. Sec. Agr. A 2-34.*

Eight induced X₃ mutant lines from latisail, seven from Patnai-23 and two from Nizersail were selected for carrying out the morphological and cytological study and therefore to find out the feasibility of including these material in the regular breeding programme.

Agr. 404 Miah, A. J. and I. M. Bhatti. 1968. **Evolution of new rice varieties by induced mutations to increase yield and resistance to diseases and to improve seed quality.** *Rice Br. with Induced Mutations, No. 86 : 75-96.*

Seeds of two *indica* rice varieties namely, Rangni-27 (a coarse variety) and Dokri Basmati (a fine variety) were irradiated with 20, 25, 30, 40, 45 and 50 kR of gamma rays from a 13000-Ci Co⁶⁰ source. In the M₁ generation (1964), germination percentage, seedling height and seed fertility were studied. The data indicated that Dokri Basmati. In the M₂ generation (1965) to polygenic traits, i.e. leaf size and grains per unit length were studied. From the analysis of the data it was found that variability was greater in the irradiated populations than in the non-irradiated controls. Apart from the study of the polygenic traits, several mutants which appeared to be useful to the breeder (e.g. dwarf, short-culm and early flowering) were isolated from the irradiated populations of Rangni-27. In the M₃ generation (1966) several agronomically important characters were studied in all the mutants isolated in the M₂ generation. It was noticed that the mean values of most of the characters of all the mutants deviated from the mean values of the respective controls. These deviations were both negative and positive. Further analysis is in progress. Three more experiments were started, two in the year 1965 on the effects of gamma rays and one in 1966 to compare the effects of EELWORMS and gamma rays.

Agr. 405 Eunus, M. and I. M. Atkins. 1969. **Estimation of heterosis manifested in F₁ from F₂ generation of rice (*Oryza sativa* L.).** *Part of Ph.D. Thesis. Texas A & M. Univ. (MS).*

F₂ generations of four crosses of rice along with their four parents, namely, Blue bonnet 50, Lacrose, C-19545, Belle patna and a selection from Hybrid Mix X Red century were grown to estimate heterosis manifested in the F₁ for yield and yield components from the segregating F₂ generations. Due to the lack of any standard procedure for calculating expected \bar{F}_1 value in rice, modifications of formulae used in corn were applied. the applied formulae were (i) over highest parent : $\frac{(2F_2 - \bar{P} - \bar{HP} \times 10)}{HP}$ and (ii) over average of parents : $\frac{(2F_2 - \bar{P} - P \times 10)}{\bar{P}}$ where F₂ = mean value of F₂, \bar{P} = Mean value of means of two parents involved in the cross and \bar{HP} = Mean value of the highest parents. It appeared from calculation of a number of characters that in certain crosses estimated F₁ values were unusually low, even less than the value of F₂. Due

to the absence of any authentic literature in this regard, the reasons for this behaviour cannot be fully explained. However, the possible reasons for this behaviour may be (i) the formulae used were inadequate, (ii) a very small number of genes was involved in the character, (iii) a very large difference existed between the parental means, or (iv) the absence of heterosis in the F_1 generation for the characters studied.

Agr. 406 Miah, A. J., I. M. Bhatti and A. Awan. 1969. **Studies on Radiation-induced mutations in some varieties of rice.** *Pakistan J. Bot.* 1 (1 & 2) : 77-86.

Dry seeds of two standard local varieties of rice namely, Dokri Basmati and Jajai-77 were subjected to different dosages of gamma-rays and fast neutron. Data on the seed fertility of the M_1 generation plants indicated that Jajai-77 is more radio-resistant than Dokri Basmati. Chlorophyll deficient and viable mutations were scored in the M_2 generation. In general the mutation rates increased with the increase in dosages of radiations. In both the varieties, the highest frequency of chlorophyll mutations induced by either neutron or gamma-ray treatments, was obtained for albina followed by viridis type. In Dokri Basmati the spectrum of viable mutations was restricted to one type only. In Jajai-77, on the other hand the viable mutant types included a wide variety of variants totaling to seven types.

Agr. 407 Zafarullah, A. H. and M. S. Haq. 1969. **A study, of the variations in some quantitative characters of rice varieties Dolar and IR-8-288-3 after hybridization and seed irradiation.** *M.Sc. (Ag.) Thesis. East Pakistan Agr. Univ. (MS).* 66 p.

The present study was designed to evaluate the comparative effectiveness of creating variability in a few polygenic characters of rice varieties Dolar and IR-8 through irradiation, hybridization and in combination of irradiation-hybridization. The experiment was conducted at Atomic Energy Centre Dacca. Irradiation was found to reduce the mean of the character days to heading in all the treatments. However, it did not cause any significant change of the disaster plant height. For other attributes changes in both positive and negative direction were observed. But irradiation was noticed to increase the variability in general for all the attributes in all the treatments. However, the combined effect of irradiation-hybridization (in F_2 N_2) resulted in more variability for all the attributes in all the treatments than either irradiation or hybridization alone. Coefficient of variability was also found to be increased in irradiated generation as compared to their non-irradiated counterparts. When these variability as generated by irradiation, hybridization and irradiation-hybridization were statistically analyzed, it revealed that variance ratio for each of the seven attributes (days to heading, plant height, number of total tillers, number of effective tillers, primary panicle length, number of grain per panicle and grain breadth) was significant at 1 percent level and for one attribute (grain length) was significant at 5 percent level. The results pointed out that irradiation-hybridization resulted in maximum variability in all ploygenic attributes, which was not possible by either of the methods alone, though the methods were effect enough.

Agr. 408 Miah, A. J., I. M. Bhatti, A. Awan and G. Bari. 1970. **Improvement of rice varieties by induced mutations to increase yield per acre and resistance to diseases and to improve seed quality.** *Rice Br. with Induced Mutations II, IAEA Tech. Rep. Series 102* : 69 - 76.

Mutagen treatments of the variety Kangni-27 have given rise to short culm and early ripening strains. Experiments have been started with the varieties Dokri Basmati, Jajai-77, IR-8 and 370 Basmati using fast neutrons, gamma rays, EELWORMS and disadvantages as mutagens. Results obtained so far show a differential response of the varieties in their radiosensitivity and frequency of leaf colour mutations.

Agr. 409 Eunus, M. and I. M. Atkins. 1971. **Genetic Behaviour of economic and morphological characteristics influencing the yield and components of yield of rice (*Oryza sativa* L.).** *Action. 9 (2)* : 62-63.

Genetic behaviour and the relationships of quantitative and qualitative characters were studied using five United States rice varieties and the F₂ and F₃ generations of six of their crosses. Biometrical data indicated that genetic variations for plant types, yield components and grain yield were evident. Partial dominance was indicated for both shorter flag leaf and shorter second leaf. Flag and second leaf indicated partial dominance for broader leaves. Flag leaf angle indicated partial dominance for open angle whereas second leaf angle also showed partial dominance for broader angle. Flag and second leaf length showed positive correlations with yield and some components of yield suggesting that they may have an influence on yield. Flag leaf width had a positive relationship with second leaf width. Although flag and second leaf width showed positive correlations with some of the yield components, they did not show significant relationships with yield. This may have been due to negative correlations with culm numbers. Both flag and second leaf angle showed negative correlations with grain yield indicating that narrow leaf angle influences grain yield.

Agr. 410 Miah, A. J. and M. A. Awan. 1971. **Induced mutations in rice. Rice Breedings with induced mutations.** *IAEA Technical Reports. Series No. 131*, 77-890.

Seeds of six *indica*-type varieties of rice, namely Dokri Basmati, Kangni-27, Jajai-77, 370 Basmati, IR-6 and IR-8, were treated with physical and chemical mutagens in six experiments during 1964-1969. Mutation spectra and mutation frequency were selected from the irradiated progenies. Only dwarf and short-culm mutants were found in variety Dokri Basmati. From variety Jajai-77, early and late maturing mutants were selected. Some early mutants showed no marked reduction in yield. A fine grain mutant, which matured in 100 days as compared to 130-133 days in the control selected from the irradiated progeny of IR-8. EMS and gamma rays were found to give the highest mutation frequency for varieties 370 Basmati and IR-8 respectively.

Agr. 411 Miah, A. J., G. Mustafa and A. M. Soomro. 1971. **Mutation Breeding in rice.** *Sabrao Newsletter 3 (2) : 121-126.*

Gamma-irradiation treatment to the rice variety IR-8 has given rise to fine grain strains with increased grain length/breadth ratios. One of them (IR8-1) matured about 26 days earlier than the parental variety. Further, 18 short-culmed and 12 early flowering lines induced from Kangni-27 were tested. None of them were superior to the control varieties in grain yield.

Agr. 412 Mia, M. F. and M. A. Choudhury. 1971. **Studies on some leaf characters in three rice crosses.** *M.Sc. (Ag.) Thesis. East Pakistan Agr. Univ. (MS). 74 p.*

The experiment was conducted at the East Pakistan Rice Research Institute, Joydebpur, Dacca, to study the inheritance, correlation and heritability of some characters in three rice crosses. The characters investigated for inheritance were plant height, flag leaf length and angle. To estimate heritabilities, some morphological characters were studied. Correlation coefficient were determined from the characters of plant height and number of culms, flag leaf angle, length and width, number of panicles with number of grains and number of grains with weight of grains. In F_2 tall and dwarf gave a fitted ratio of 3:1 indicating a monogenic control of plant height. The broad sense heritability estimates showed highest heritability for plant height and lowest heritability for second leaf length. Correlation coefficient studies showed significant correlation between plant height and number of culms in some cases and in some instances negative correlation was observed. Correlation for certain characters in some crosses under different conditions was found to be extremely variable. Correlation between number of panicles and grains was found to be significant. It was observed that angle was partly dependent on leaf length and width and was greatly influenced by environmental factors.

Agr. 413 Newas, M. A. and M. S. Haq. 1971. **A study on the genetics of earliness in rice.** *M.Sc. (Ag.) Thesis, Bangladesh Agr. Univ. (MS). 65 p.*

The research work was undertaken at the Atomic Energy Centre, Dacca to study the genetics of earliness in two rice crosses having a common parent, with an objective of supplying genetic information of this character for use in a programme of breeding high yielding varieties combined with earliness. In addition, data on plant height, total number of tillers, number of productive tillers, primary panicle length, number of grains per primary panicle were taken to study if there was any correlation between these characters and earliness. Mean values and distribution indicated that heading data was a quantitative character and governed by a number of genes. Earliness was completely dominant in one cross, and lateness was partially dominant in another cross. F_2 behaviour was more or less similar in Aus and Boro seasons. Both positive and negative associations between plant height and days-to-heading were recorded in F_2 populations of two crosses. Total number of tillers and number of productive tillers were found to be negatively correlated with heading data; in one cross correlation of total number of tillers was, however, insignificant, Primary panicle length registered positive association with days to heading in one cross and no association in

another. Dominance of tallness in one cross and positive heterosis in other were observed in F₁. Low total tillers and low productive tillers seemed to be dominant over their respective high counts in one cross. In both the crosses complete dominance of long primary panicle over short primary panicle was observed.

Agr. 414 Ali, M. H. and M. Rahman. 1972. **Studies on some induced mutants of rice.** *M.Sc. (Ag.) Thesis, Bangladesh Agr. Univ. (MS). 56 p.*

Some studies were made on the nature of gamma ray-induced mutants of two local aman rice varieties. Latisail and Nizersail in M₄ generation with a view to determining their varietal status with respect to certain characters and their suitability as parental lines that could be used in a hybridization programme. The mutants included in the study were Latisail 4, 6, 9, 16 and 26 and Nizersail 67, 73-9, 96, 98, and 102. All the mutants were found true breeding, for the selected characters such as length of growing period, plant height, tillering, panicle length, and the number of grains in a panicle. Except Latisail-9 and Nizersail-102 all other mutants were found to be partially sterile as shown by a relatively high pollen and seed sterility compared to the parents. Cytological studies revealed that except Nizersail-102 all other mutants of Nizersail and Latisail contained some form of aberrant chromosomes. The abnormalities detected were of the following types : Loose pairing, asynapsis, fragments, Laggards, ring or open chain, translocated chain, quadrivalents, multivalents, stickly chromosomes and multisome.

Agr. 415 Imam, S. A. and A. M. S. Ahmed. 1972. **Combining ability of different varieties or rice with IR8.** *M.Sc. (Ag.) Thesis, Bangladesh Agr. Univ. (MS). 107 p.*

The experiment was conducted at the Bangladesh Rice Research Institute at Joydebpur, Dacca in Aus season of 1970 in order to estimate (1) the heritability of different yield contributing or quantitative characters for a guide line in future selection, and (2) the combining ability of different varieties of indigenous rice with IR8. Seven top crosses of IR8 with Dharial, Panbira, Pukhi, Kataktara, Patuakhali, Hashikalmi, and Dular were taken for study. It was concluded from the genetic variances and the heritability values that as far as the seven characters studied of the seven top crosses, as regard their combining ability, selection in the early generation for plant height, days to heading and number of fertile grains per gramme would be in general effective; for panicle length only in Pukhi X IR8, Dharial X IR8, and Patuakhali X IR8, would be effective; for number of fertile tillers per plant only in Pukhi X IR8 may be effective; for percentage of fertile spikelets per panicle none of the seven crosses would be effective; and for yield per plant only in Dharial X IR8 to some extent may be effective. However, considering the overall means of genetic variances and heritability values of all the characters studied of the different crosses, the crosses may be arranged in order of their combining ability as follows : Dharial I X IR8, Panbira X IR8, Patuakhali X IR8, Dular X IR8, Pukhi X IR8, Hashikalmi X IR8, and Kataktara X IR8.

Agr. 416 Shahjahan, M. 1972. **Potential use of mutation breeding for the control of rice stem borers.** *Nucl. Sci. Appl.* 6(A) : 64-65.

A recent estimate shows about a 2.8% damage of rice by stem borers in Bangladesh. The chemical attacks have very little appreciable results. Therefore a proposal, with a support from the preliminary results, has been made to use mutation breeding for the development of stem borer resistant rice varieties. This method seems to be very effective because of their host-plant specificity and internal feeding habit.

Agr. 417 Choudhury, A. R. 1973. **Cytological studies in a sterile type of rice.** *Bangladesh J. Bot.* 2 (1) : 113-117.

Cytological observation of the pollen mother cells in a line of rice, G2254 (an off type in a field of the standard variety (Belle Patna), revealed a characteristic poor synopsis between homologous chromosomes, resulting in the occurrence of a variable number and univalent at diakinesis and metaphase I and lagging of chromosomes at anaphase I. The mature pollen grains appeared aborted and anthers never dehisced. Line G2254 failed to produce seed upon selfing.

Agr. 418 Eunus, M., I. M. Atkins, and J. W. Stansel. 1973. **Inheritance study of qualitative characters of rice (*Oryza sativa* L.).** *Bangladesh J. Bot.* 2 (2) : 47-54.

An experiment was undertaken with five parents (Blue bennet 59, Lacrose, C19545, Belle patna and a selection from Hybrid mix X Red century) and F₂ and F₃ generations of six of their cross combinations to investigate the inheritance patterns of awn development, pericarp colour, apiculus in F₂ and F₃ generations of rice. Segregation of plants in F₂ and F₃ generations established ratios 3 : 1 and 23 : 3 as well as 5 : 3 and 49 : 15 for awn to awnless respectively indicating that awning was governed by one or two genes. For inheritance of pericarp colour two ratios 9 : 6 and 3 : 1 for coloured to colourless were obtained in F₂ and these two ratios were confirmed by succeeding F₃ generations. Apiculus colour established two ratios 15 : 1 and 3 : 1 for coloured to colourless in F₂ as well as 55 : 9 and 5 : 3 in F₃ generations respectively.

Agr. 419 Islam, M. N. and C. A. Razzaque. 1973. **Study of morphological characters and fertility in local and foreign strains of rice and their F₁ progeny.** *M.Sc. (Ag.) Thesis, Bangladesh Agr. Univ. (MS).* 115 p.

The local variety Naizersail was crossed with eight foreign rice strains introduced from IRRI, the Philippines to obtain base materials for a long term breeding programme. The parents and the F₁'s were grown under similar environmental conditions for the study of some morphological characters and fertility. In all the crosses considerable amount of positive heterosis was observed for plant height. In case of number of tillers and flag leaf length only two crosses were observed to give considerable amount of positive heterosis. Amongst all the crosses six showed considerable negative heterosis with respect to flag leaf angle. A tendency

of increase in panicle length was observed in all the crosses. No considerable heterosis was found in percentage of seed set in any cross. Among the hybrids, the taller plant was found in all the crosses. The higher number of tillers were dominant over lower number, and the longer leaf was observed to be dominant over shorter leaf in all the crosses. Flag leaf breadth was found to be dominant, partially dominant and intermediate in different crosses. In five crosses, narrower flag leaf angle. The longer panicle was found to be over dominant over shorter panicle in five crosses and dominant in the other three crosses.

Agr. 420 Rahman, M. A. and A. M. Eunus. 1973. **Inheritance of four yield component in a six-pattern diallel cross of rice (*Oryza sativa* L.).** *Bangladesh J. Bot.* 2 (1) : 119-130.

Inheritance of four yield components (panicle length, number of primary branches, number of grains and yield per panicle) was studied in a six-pattern diallel cross rice (*Oryza sativa* L.). Average over dominance was indicated in all the four characters. The variety Kaohsung was found to possess an excess of recessive genes, whereas the varieties C-P-231 and IR-8 were observed to possess an excess of dominant genes for all the four characters. Only one dominant effective factor was detected to condition each of four characters. Heritability was estimated to be 32, 22, 19 and 22 per cent for panicle length, number of primary branches, number of grains and seed yield per panicle, respectively.

Agr. 421 Shahjahan, M. and Miah, M. A. H. 1973. **Deferential attacks on some of the radiation-induced mutant lines of Latisail rice variety by rice stem borers.** *Nucl. Sci. Appl.* 7 (A) :

Some radiation-induced mutant lines of Latisail rice variety were evaluated in the field estimating their degree of borer attacks. These were the Latisail-4, Latisail-6, Latisail-9 and Latisail-16. The percentage of rice hills with "dead hearts" was 14.00 and 29.25 for the Latisail (mother) and Latisail-16 respectively. But for the same plant types, the percentage of hills "whiteheads" was 3.25 and 1.75 respectively. The variation of attacks on others was more or less the same at different times. Similar results were also obtained while counting the percentage of tillers with "dead hearts" and "whiteheads". The Latisail-6 was found comparatively more resistant during early stage and Latisail-16 during later period of plant growth.

Cultural Practices

Agr. 422 Karim, M. M. 1964. **A comparative study on the planting practices in rice.** *M.Sc. (Ag.) Thesis. East Pakistan Agr. Univ. (MS).* 51 p.

An experiment was conducted with Aus paddy to compare the different methods of planting. In broadcast method there was an increasing trend in the grain yield with the increase in seed rate per acre. In the line-sowing crop row to row spacing did not increase the grain yield significantly although the highest yield was obtained from the 8 inches row to row spacing. Broadcasting method produced significantly lower yield than those of line-sowing as well as

transplanting ones but there was no significant difference between the latter two methods, although line-sowing showed superiority over transplanting method.

Agr. 423 Karim, M. A. 1965. **A study into the effect of time of planting and plant to plant spacing on the yield and yield. Contributing characters of transplant aman paddy variety DA-31.** *M.Sc. (Ag.) Thesis. East Pakistan Agr. Univ. (MS). 100 p.*

The effects of different dates of planting, plant to spacing and yield contributing characters were studied in the transplant Aman rice in the East Pakistan Agricultural University Farm, Mymensingh. None of the spacing was found significant, however, highest grain yield was obtained in favour of medium spacing (8 inches). The earlier the planting the higher was the total number of tillers and also the fertile tillers. Wider spacing and earlier transplantation significantly increased in panicle length and panicle weight. Medium spacing and earlier transplantation significantly increased the grain and straw yield.

Agr. 424 Miah, N. M. and S. M. Hasanuzzaman. 1965. **A study to determine a suitable day of harvest for the highest yield and quality of boro paddy.** *M.Sc. (Ag.) Thesis. East Pakistan Agr. Univ. (MS).*

The experiment was conducted at Agricultural Research Institute, Dacca-5 to study the effect of six different date of harvest on the yield and quality of Boro paddy. The variety tested was Habiganj VI and dates of harvesting were after 15, 20, 25, 30, 35 and 40 days of flowering. The observations were made on the yield, embryo maturity, germination capacity, grain and cooking qualities. The significantly highest yield of grains of 20.34 pounds per plot was obtained by harvesting the plants after 30 days of flowering. The development of different parts was found to be completed in the embryo of grains obtained 15 and 20 days after flowering. However, the procambial strand was less developed in such embryos. The germination percentages of grains harvested after 15, 20 and 30 days of flowering did not differ significantly. The moisture content of the grains decreased with the delayed harvesting. The grain to husk ratio showed a significant increase up to harvesting after 35 days. Grains obtained by harvesting after 35 days of flowering had the maximum hardness and the best cooking quality. The volume expansion on cooking was least in the grains harvested after 15 days of flowering. In general it was observed that Boro paddy when harvested 30-35 days after flowering had higher grain yield and better cooking quality.

Agr. 425 Sattar, M. A. 1966. **Study on the adoption of a few improved practices of T. aman paddy in a selected area of East Pakistan and suggestions for wider adoption.** *M.Sc. (Ag.) Thesis. East Pakistan Agr. Univ. (MS). 98 p.*

A specially designed questionnaire was used for gathering information from the farmers of Basan Union, Joydebpur, Dacca to ascertain the improved practices in T. Aman paddy they adopt and the extent to which they adopt such practices. It was found that improved varieties of seeds, use of N, P, and K fertilizers and curative plant protection measures are adopted by many farmers. seed treatment is also adopted by a few of them. Improved method of rising

seeding is also adopted by few. Water control-irrigation and drainage and improved method of transplanting are not adopted by any of them. Local demonstration by local farmers themselves should be so arranged that the results or benefits are spectacular and massive and this will act as positive and effective means for large scale production.

Agr. 426 Ahsan, M. A. 1968. **A comparative study on the performance of IR-8 and Dhariyal varieties of rice, growth in different methods of planting under different combinations of nitrogen, phosphorus and potassium.** *M.Sc. (Ag.) Thesis. East Pakistan Agr. Univ. (MS). 162 p.*

An experiment was conducted in the Agricultural Univ. Farm, Mymensingh with 5 fertilizer doses to study the relative performance of IR8 and Dhariyal varieties of rice grown in methods broadcasting and transplanting. The variety IR-8 was excellently better than Dhariyal. The variety IR-8 produced significant effect on ear-bearing tillers, straw and grain yield, panicle length in respect of fertilizer and planting method. Dhariyal has also produced significant effect on straw and grain yield but yield was very much lower than IR8. The method, transplanting was best for IR8.

Agr. 427 Hossain, S. M. A. and A. L. Mian. 1968. **A comparative study of the growth habits of some recommended rice varieties of East Pakistan and some exotic rice varieties obtained from the International Rice Research Institute.** *M.Sc. (Ag.) Thesis. East Pakistan Agr. Univ. (MS). 108 p.*

A study was made at the East Pakistan Agricultural University Farm at Mymensingh during 196 in the aus season with five indigenous varieties, six exotic varieties and two different methods of planting. Transplanting significantly increased plant height at harvest, number of effective tillers per plant, panicle length, spikelets number per panicle, grain yield and straw yield per plant over the broadcast method of planting. Transplantation also increased the duration of active vegetative phase in all varieties of rice. It was further observed that transplantation caused a delay of maturation in all indigenous varieties including two exotic ones.

Agr. 428 Islam, M. A. 1964. **A study on the growth habits of some exotic varieties of rice obtained from the International Rice Research Institute.** *M.Sc. (Ag.) Thesis. East Pakistan Agr. Univ. (MS). 94 p.*

The present study was undertaken with a view to observing the growth, habit, morphological characters and performance of 10 selected rice in two different methods of planting broadcasting and transplanting at the East Pakistan Agril. University Farm, Mymensingh in 1967. All the varieties studied performed better when transplanted than what they did under broadcast sowing, although broadcast crops matured 2-7 days earlier than the transplanted ones.

Agr. 429 Khandoker, N. H. and A. M. Shamsuddin, 1968. **Effect of delayed transplantation in two photoperiod sensitive varieties of transplanted aman rice, Nizersail and Latisail.** *M.Sc. (Ag.) Thesis. East Pakistan Agr. Univ. (MS). 115 p.*

The investigation was made from June 1967-January 1968 at the Field Laboratory of the Agricultural University, Mymensingh, East Pakistan. The crop was transplanted on eight dates, July 15, 25, August, 4, 14, 24 and September 3, 13 and 23. The dates of transplantation showed a non-linear response in grain yield of rice. The yield increased at a rate of 0.58 kg. per plot due to transplantation up to July 25, and then decreased at the rate of 0.13 kg. per plot up to the last date. The varieties differed in grain yield and also in the nature of response to planting dates. Latisail produced maximum grain yield to the extent of 4387 kg/ha. when transplanted on August 4 i.e. on the 4th date. Nizersail produced maximum grain yield to the extent of 3800 kg/ha when transplanted on July 15 i.e. on the first date. It appeared from the result that Nizersail a late maturing variety was really a long duration variety and hence required an earlier planting for maximum yield, while Latisail a comparatively early variety was a short duration variety and hence could be planted relatively late in the season.

Agr. 430 Mia, N. M. and S. M. Hasanuzzaman. 1968. **A study to determine a suitable date of harvest for the highest yield and quality of boro paddy.** *Proc. 20th Pakistan Sci. Conf. Abs. Sec. Agr. A-34-35.*

An experiment was designed to study the effect of six different dates of harvest on the yield and quality of Boro paddy. The variety tested was Habiganj VI (Pushusail). The observations were made on the yield, embryo maturity, germination capacity, grain and cooking qualities. The number of tillers per hill with matured grains was maximum (19.39) in case of plants harvested after 30 days of flowering. Whereas the number of tillers per hill with immature grains was maximum (5.25) when the plants were harvested after 15 days of flowering and there were no such tillers after 30 days of flowering. The significantly highest yield of grains of 20.34 pounds per plot was obtained by harvesting the plant after 30 days of flowering. The yields from all other harvestings were inferior to that obtained after 30 days of flowering. The development of different parts were found to be completed in the embryos of grains obtained 15 and 20 days after flowering. However, the procambial strand was less developed in such embryos. The germination percentage of grains harvested after 15, 20 and 30 days of flowering did not differ significantly though numerically the highest value of 90.87 per cent was obtained from the grains of 30 days after flowering. The moisture content of the grains decreased with the delayed harvesting. The weight of 1000 grains and volume of 1000 kernels increased significantly up to the harvesting after 30 and 35 days of flowering.

Agr. 431 Mian, A. L. and S. M. M. Hossain, 1968. **The growth phases and their durations of some recommended rice varieties obtained from the International Rice Research Institute.** *Pakistan J. Biol. Agr. Sci. II (2) : 51-57.*

A study was made in the Agronomy Field Laboratory of the East Pakistan Agricultural University, at Mymensingh, during the year 1967 with five indigenous Aus varieties-Dharia,

Dular, Charnock, Marichbeti, and Kataktara, and six exotic varieties namely IR8, IR 62-18-2, PH-4-11, Bluebelle, MIFB-322-1, and Taipei, 177, to identify the different phases of growth and their durations. In the present study five growth phases, namely, (a) germination, (b) active vegetative, (c) lag-vegetative, (d) active reproductive, and (e) grain development and ripening were recognized in the rice varieties under study. All varieties, except Bluebelle, exhibited all the growth phases in the broadcast crops while the transplanted crops of all varieties did not exhibit the lag-vegetative phase at all in their life cycle. Transplantation exerted appreciable lengthening effect upon the length of the active vegetative phase which caused the elimination of the lag-vegetative phase in this methods of planting. Active reproductive phase was influenced slightly by the methods of planting, while methods of planting exerted an erratic influence upon the grain development and ripening phase. It was observed that transplantation exerted greater lengthening effects over the total active growth duration in the indigenous varieties of rice than it did on those of the exotic ones.

Agr. 432 Tajuddin, S. 1968. **A study of the growth pattern of IRRI rice variety IR-8-288-3 with 3 different planting densities.** *M.Sc. (Ag.) Thesis. East Pakistan Agr. Univ. (MS). 31 p.*

An experiment was conducted at the East Pakistan Agril. Research Institute Farm in 1967 to find out the optimum combination of row to row and hill to hill spacings for successful cultivation of IR8-288-3 rice variety. Height of the plant was found to increase with increased spacing. The wider the planting the greater spacing. The wider the planting the greater was the number of total and effective tillers per hill. With the increase in spacing the average number of total spikelets and effective spikelets showed a tendency to decrease. There was a gradual increase in the weight of 1,000 grain/plot as the spacing increased. Maximum grain weight was obtained with 56" X 10" spacing with was 7527.20 lbs/acre. Straw decreased with increasing spacing. As the spacing decreased the plant population increased.

Agr. 433 Ahmed, M. U. and A. M. Shamsuddin. 1969. **A study on the growth habits of eight cultivated varieties of aus paddy under three methods of planting.** *M.Sc. (Ag.) Thesis. East Pakistan Agr. Univ. (MS). 92 p.*

An experiment was carried out in Agril. University Farm, Mymensingh during the period from May to August, 1968 to study the growth habits of 8 cultivated varieties of Aus paddy under three methods of planting. The effects of broadcasting and line sowing were statistically identical on active vegetative phase, lag vegetative phase, active reproduction phase, grain development phase and ripening phase and total growth duration. Transplanting significantly increased the active vegetative phase, grain development and ripening phase and total growth duration. The highest straw yield was found in Harinmuda variety and highest grain yield in Hashkalmi variety.

Agr. 434 Banik, M. L. and M. Ahmed. 1969. **A study of the effect of planting density on the tillering habits of two varieties of paddy, IR-5 and Chinese-1.** *M.Sc. (Ag.) Thesis. East Pakistan Agr. Univ. (MS). 94 p.*

A study was made with 2 varieties of rice IR-5 produced more tillers-total and fertile, total spikelets and fertile spikelets than Chinese-1. At harvest IR-5 was good with 10" and 12" hill to hill distances and Chinese 1 was good with 6", 8" and 10" hill to hill distances in respect of total tiller production. The variety and row to row spacing had no significant effect on grain yield and hill to hill distance produced a significant effect on grain yield when hill to hill spacing increased, the straw yield decreased.

Agr. 435 Bashir Siddique, M. S. and A. Alim. 1969. **A study on the effect of different methods of planting on the yield of a few selected *Indica* and *Japonica* varieties of rice.** *M.Sc. (Ag.) Thesis. East Pakistan Agr. Univ. (MS). 51 p.*

Five high yielding varieties of rice, two of *indica* sub-species and three of *japonica* sub-species were grown in three different methods, viz. direct seeding in lines, direct seeding by broadcasting and transplanting at the Agricultural Research Institute sub-station, Barisal, in Boro season of 1966-67 to study the different yield contributing factors, such as maturity duration, number of fertile tillers per plant, length of panicle, sterility percentage, yield of grains, grain-straw ratio, weight of 1000 grains and other important correlated factors. Transplanted plants showed a shorter plant height, longer maturity duration, higher number of fertile tillers, low percentage of sterility, higher grain yield, higher grain-straw ratio and higher 1000 grain weight than the other two methods of direct sown rice. The maturity duration of IR9 was the longest and Norin 1 was the shortest. The plant height of Taipei 177 was the tallest and IR9 was the shortest. IR8 gave the highest grain yield followed by IR9, Taipei 177, Norin 1 and Yabani M7 respectively. In all respects IR8 was superior to all other varieties excepting the sterility percentage in which case Norin 1 had no sterile grains.

Agr. 436 Hamid, M. A. and A. Alim. 1969. **A study of the effect of spacing on the yield contributing characters of five recommended aus varieties and one IRRI variety of rice under transplant condition.** *M.Sc. (Ag.) Thesis. East Pakistan Agr. Univ. (MS). 92 p.*

A varietal-cum-spacing experiment was conducted with five local recommended Aus varieties, Dharial, Kataktara, Dular, Dhalasaita and Marichbati, and one IRRI variety (IR8) under transplant condition with six spacing, 9" X 9", 12" X 6", 9" X 6", 12" X 3", 6" X 6" and 9" X 3" with the objective of finding out : the adaptability of these varieties under transplant condition, influence of spacing on their yield contributing characters, optimum spacing for each variety, and the comparative performance of local varieties and IR8. The variety IR8 produced the highest grain yield per acre. The local Aus varieties differed significantly in their adaptability to transplanting. Among them, the earliest variety, Dular gave the highest per day as well as per acre grain yield. With increase in spacing, characters like plant height, effective tillers per hill, panicle length, number of spikelets per panicle and single hill grain yield increased. The increase in the number of spikelets per panicle and single hill grain yield increased. The increase in the number of effective tillers per hill in the wider spacing was

disproportionate to the decrease in the number of hills per unit area which resulted in the lesser grain yield per acre at wider spacings. Spacing had no appreciable influence on sterility percentage of spikelets, 100-gram weight and grain/straw ratio. Closer spacing shortened the life-span of all the varieties by 3 to 6 days. Spacing 12" X 3" was found to be optimum for all the varieties. Though highest yielder, IR8 has the longest life-span.

Agr. 437 Hossain, M. P. and A. Alim. 1969. **Study on the effect of broadcast vs. line sowing on the yield contributing on the yield contributing characters of some IRI and local Aus varieties of rice.** *M.Sc. (Ag.) Thesis. East Pakistan Agr. Univ. (MS). 92 p.*

The response of four local Aus varieties, namely Dhariyal, Panbira K.P.F.-6, and Rangmahal, and four IRRI varieties namely IR8-288-3, IR66-54-1 and IR-342-2, to three different methods of sowing, namely, broadcasting, sowing in 9 and 12 inches apart lines, were studied under direct seeded rainfed Aus conditions. The experiment was conducted in a randomized complete block design with four replications in the Jamalpur Rice Research Sub-station of East Pakistan in 1968. The varieties differed widely i respect of their different quantitative characters that contribute towards grain yield per acre. The methods of sowing influenced only the number of fertile spikelets per panicle and the yield of grain per acre. Among the methods, sowing in 9 inches apart lines was superior to broadcasting but did not differ from sowing in 12 inches apart lines. Broadcasting and sowing in 11 inches lines were, however, similar i terms of grain yield per acre. The local varieties, Dhariyal and Panbira gave both higher per acre and per day grain yield than the other varieties. Among the IRRI varieties, IR 9-54-1 was found to be suitable for upland direct seeded rainfed conditions, but this variety has the disadvantage of a longer life span as compared to the local varieties.

Agr. 438 Islam, M. A. 1969. **Effect of seed rate and method of sowing on the yield of one local recommended aus variety and two exotic varieties from the Philippines.** *M.Sc. (Ag.) Thesis. East Pakistan Agr. Univ. (MS). 57 p.*

A study was made in Aus season in 1968 at East Pakistan Agricultural Institute Farm to study the optimum seed rate/acre, methods of sowing on the two varieties of rice. Effect of variety on the yield contributing character like total number of tillers/plant was found significantly different with IR-8 topping the list. Method of sowing and seed rate and also triple interactions of variety, method and seed rate were significantly different. Line sowing 25 lb. seed/acre was found better and i the triple interactions variety-wise IR-8 responded to higher yield with no significant difference among them in the other two varieties.

Agr. 439 Latif, M. A. 1969. **A study of the growth habits and performance of IR8-288-3 and Dhariyal varieties of rice under different dates and methods of planting.** *M.Sc. (Ag.) Thesis. East Pakistan Agr. Univ. (MS). 127 p.*

The experiment was laid out in split plot design in East Pakistan Agricultural University Farm, Mymensingh to study the growth habits and performances of two rice varieties. Two varieties under study showed no significant effect on the yield contributing characters due to the broadcasting and transplanting methods of planting. Dates of planting has a profound influence on the yield contributing characters. The influence of interaction among the planting

tillers/plant, total spikelets/panicle, plant height at harvest, grain weight/plot, total grain yield and straw yield.

Agr. 440 Rahman, S. M. 1969. **Different methods of seedling raising and their effects on growth habits and yield ability of some indigenous and exotic varieties of rice.** *M.Sc. (Ag.) Thesis. East Pakistan Agr. Univ. (MS).* 94 p.

An experiment was conducted at the Agronomy Field Laboratory of the East Pakistan Agricultural University, Mymensingh during period from April to October, 1968 to study the effects of 3 methods of seedling raising on the growth habit and yield ability of 13 varieties of rice. The varieties differed significantly in the durations of their different phases of growth as well as in the length of their respective total growth duration. Methods of seedling raising significantly influenced the grain yield, the yield being highest in the floating seedling and lowest in the dapog seedling. The varieties also significantly differed in grain production. The varieties-Dharial, Katakbaria, Charnok, Dular and Marichbati produced significantly the higher grain yield with floating seedlings.

Agr. 441 Shamsuzzoha, A. K. M. and A. M. Shamsuddin. 1969. **A study on the effect of population size and fertilization to counteract the loss in yield due to delayed transplantation of aman paddy, variety-Latisail.** *M.Sc. (Ag.) Thesis. East Pakistan Agr. Univ. (MS).* 155 p.

The investigation was carried out to study the response of a rice variety-Latisail to different dates of planting, spacing and fertilizer doses. Spacing has had significant effect on the production of grain per plot. All the doses of fertilizer significantly effected grain yield. Straw yields due to planting dates, spacing and fertilizer were found to differ significantly. The straw yield increased with the increasing doses of fertilizers. Among the yield contributing characters-plant height, panicle length, number of spikelets/panicle and individual grain weight were favourably influenced by earlier planting while the numbers of tillers were more in later planting. Late transplantation requires close spacing of plants with heavy doses of complete fertilizers.

Agr. 442 Eunus, M. and M. Yunus. 1970. **Effect of age of seedling and number of seedling per hill on the yield of IR20 rice cultivar (*Oryza sativa* L.).** *M.Sc. (Ag.) Thesis. East Pakistan Agr. Univ. (MS).*

IR20 rice seedlings of 20, 27, 34 and 41 days old were planted at the rate of 1, 3, 5 and 7 seedlings per hill on 18 August 1970 at a constant spacing of 10" X 8" to find out the optimum age of seedling and number of seedlings to be planted per hill to produce maximum grain yield. Grain yield was significantly influenced by the number of seedlings per hill, age of seedling and their interactions. The maximum grain yield resulted from planting 3 seedlings per hill was statistically identical with that or planting with 5 seedlings per hill. The yield differences due to planting of 1, 5 and 7 seedlings per hill were identical. 27 day old seedlings produced the highest grain yield and which was statistically identical with that produced by 34 and 41 day old seedlings. Interaction results indicated that the use of 3 seedlings per hill at the age of 27 days is conducive for the production of maximum grain yield.

Agr. 443 Rahman, L. 1970. **Effect of double and single row planting of three transplant aman rice varieties under farm condition.** *Proc. All Pakistan Annu. Sci. Conf.* 21.

Response of three Transplant Aman rice varieties (Nizersail, Latisail and IR-8) to double and

single row plantings were studied during the period from July to December, 1967. Double row plantings produced more grain than the single row plantings but the mean difference was not statistically significant. The variety Latisail was found to produce more grain per plot than the other two. Its effect was statistically superior to Nizersail beyond 5% level. While the variety IR-8 also showed a significant difference with Nizersail. Variety Nizersail produced minimum grain yield per plot.

Agr. 444 Mian, A. L. and M. A. Gaffer. 1971. **Granular nitrogen (2, 4-dichlorophenyl 4-nitrophenyl ether) as an herbicide in boro rice culture.** *Int. Rice Comm. Newsletter. XX (4): 20-24.*

A study was made to evaluate a granular formulation of nitrogen as a herbicide in Boro rice culture with seedlings of IR8 cultivar, grown in conventional, floating, and Dapog types of seedling nurseries. The weed control treatments included in the study were (a) hand weedings, (b) application of herbicide, and (c) no weed control. Seedlings grown in different types of nurseries gave identical grain yields. The herbicide treated crop gave as much of grain yield as did the hand weeded crop. Weeds when not controlled significantly reduced grain yield.

Agr. 445 Saqui, M. A. and A. M. Shamsuddin. 1971. **A comparative study of 63 IRRI rice strains and a local aus variety for certain characteristics.** *M.Sc. (Ag.) Thesis. East Pakistan Agr. Univ. (MS). 87 p.*

An experiment was carried out in the East Pakistan Agril. Univ. Farm, Mymensingh during the period from May to October, 1969 with 63 strains of IRRI rice and a local Aus variety. 36 strains produced the highest yield of grain which were acceptable. Of these only 10 strains produced grain yield between 23.95 and -28.19 mds/acre, 11 strains produced yields of 15-20 mds/acre and the rest of the 15 strains were poor with low yield.

Agr. 446 Eunus, M. and M. A. Sadeque. 1973. **Effect of direct sowing, transplanting and spacing on the yield of four local varieties of Aus rice (*Oryza sativa* L.).** *Bangladesh J. Agr. Sci.*

Four local varieties of rice- Dhariakataktara, Morichbati and Horinmuda were studied under direct sowing and transplanting in 25.40 cm. apart rows with 10.16, 15.24, 20.32 and 22.66 cm. apart hills in the rows during the year 1970 at the farm of Bangladesh Agricultural University. The experiment was filled in a split-split-plot design with method of planting in the main plots, varieties in the sub-plots and spacing in the sub-sub-plots. Daria gave the maximum grain yield/unit area followed by Kataktara, Marichabuti and Horinmuda. Theirs yield differences were not statistically significant. All varieties except Narinmuda sown directly in rows resulted significantly higher yield than that of the transplanted ones. Although the wider spacing (25.40 cm. X 22.86 cm. and 25.40 cm X 20.32 cm.) tended to produce increased number of ears/plant and increased number of filled grains/panicle yet an overall increased grain yield/unit area was obtained from the closer spacing (25.40 cm x 15.25 cm and 25.40 cm. x 10.16 cm.) because the increased grain yield/plant in the former could not compensate the higher grain yield obtained/unit area due to the larger plant population in closer spacing.

Agr. 447 Mian, A. L. and M. A. Gaffer. 1973. **Effect of Root and leaf Mutilation of Seedlings on the Yield of Boro Rice.** *Bangladesh J. Sci. Ind. Res.* 8 (1-4) : 27-31.

Mutilation of root and leaves of seedlings at transplanting significantly reduced grain and straw yields in Boro rice. Mutilation of roots was significantly more harmful than that of leaves. In comparison to non-mutilated seedlings, root mutilation, leaf mutilation, and root and leaf mutilation reduced grain yield to the extent of 19.36, 10.32, and 22.58 per cent respectively. Likewise, the extent of straw yield reduction in the aforesaid types of mutilated seedlings were 19.02, 8.82 and 25.77 per cent respectively. When grown as a Boro crop IR8 and Tepi varieties of rice did not differ in their response to mutilation of roots and leaves of seedlings at transplanting.

Agr. 448 Shahiduzzaman, A. N. M. and M. N. H. Khan. 1973. **Studies on the effect of cultural practices and different sources of organic matter on the local and exotic culti var of rice (*Oryza sativa* L.)** *M.Sc. (Ag.) Thesis. Bangladesh Agr. Univ. (MS.)* 30 p.

An experiment was conducted at the Bangladesh Agril. University farm in the year 1972 during the Aman season to study the effect of cultural practices and different sources of organic matter on the local and exotic cultivar of rice (*Oryza sativa* L.). The results revealed that there was no significant effect on grain yield due to the cultivars and cultural practices. However, sources of organic matter showed highly significant effect on the grain yield on both the cultivars of rice. Organic matter supplied through green manuring gave the highest yield which was followed by cow-dung and control treatments respectively. Mulching by wheel-hoe was most economic as it required manpower for the operations and hence gave maximum profit among the three cultural practices by wheel-hoe, nirani and sickle. The variety showed significant effect in respect of plant height, total tillers and straw yield.

Entomology

Agr. 449 Alam, M. Z. 1962. **On the Biology of rice swarming caterpillar, *Spodoptera mauritia* boisduval (Noctuidae: Lepidoptera) in East Pakistan.** *Annu. Rep. Div. Entomol.*

Biological studies on rice swarming caterpillar, *Spodoptera mauritia* Boisduval were conducted during the periods from 1960 to 1962. The larvae are voracious eaters on the foliage of rice and other grasses. The host plants and the distribution of the pest have been briefly indicated. The nature and extent of damage have been given. The life history has been worked out and described. Seasonal occurrence has been indicated. The natural enemies recorded in East Pakistan have been enlisted.

Agr. 450 Alam, M. Z. 1962. **A New Species of Parasite of Rice Hispa Recorded in East Pakistan.** *Annu. Rep. Div. Entomol.*

In course of the ecological studies of rice hispa, *Hispa armigera* Olivier, a new species of

larval parasite has been recorded. The parasitic insect has been designated as *Bracon hispae* Alam. The habits of the parasite has been briefly enumerated. Nature of injury on the host grub has been described. The period of its abundance has also been indicated.

Agr. 451 Alam, M. Z. 1962. **Notes on Parasites of Rice Borers in East Pakistan.** *Annu. Rep. Div. Entomol.*

Rice borers cause serious damage to rice crops in East Pakistan. Four species of borers have so far been recorded. The borer pests are attacked by a number of insect parasites in their different stages. During the study of life histories and biologies of the pest species, both in the field and in the laboratory, the following parasites were recorded.

Agr. 452 Alam, M. Z. 1962. **Use of *Bacillus Thuringiensis* Berliner for the Control of Rice Ear-Cutting and Swarming Caterpillars In East Pakistan.** *J. Sci. Res. 14 (3).*

First attempt was made to use bacteria for the control of insect pests in Pakistan. The bacterium, *Bacillus thuringiensis* Berliner was used in a series of laboratory experiments against the larvae of rice ear-cutting and swarming caterpillars. A historical review of the bacterium was enumerated. Identity and availability of the bacterium were discussed. The insects susceptible to the bacterium have been enlisted. Infectivity tests were conducted on larvae by injecting the bacterium. Ingestion tests of larvae by the microbe were made spraying the bacterium spores on the insect food. In most of the cases results proved effective but further trials would be necessary for confirmation of the tests by concluding the premature initiation of a bacterium epizootic.

Agr. 453 Alam, M. Z. 1963. **A Record of Parasite on Rice Leaf Roller, *Cnaphalocrosis Medinalis* Guenee.** *Annu. Rep. Div. Entomol.*

During the biological studies of rice leaf-roller, *Cnaphalocrosis medinalis* Guenee a few parasites has been recorded.

Agr. 454 Alam, M. Z. 1964. **Experiments to Determine the effect of Insecticides, Folidol, Dip-Terex and Endrin on the Yield of Paddy Minimising the Infestation of Stem Borer.** *Rev. Res. Div. Entomol.*

Experiments were conducted on 'Lati-shail' Aman treated with Folidol E-605 0.05%, Dipterex 0.1 %, Endrin 0.2% and control (untreated). Treatment started one month after transplantation repeated three times at an interval of four weeks. Before each treatment random samples were taken for dead hearts count. Yield of grain harvest was taken and recorded for each plot. Records revealed that the plot treated with Folidol E-605 had less infestation of stem borers and also resulted better yield than those treated with other which also showed considerable difference in yield as compared with that of control.

Agr. 455 Alam, M. Z. and A. H. Siddiqui, 1964. **Control Of Rice Borers**. *Rev. Res. Div. Entomol.*

The experiment was conducted on Aman crop during the periods from August to December, 1955. The experiments were laid out in randomised block design with five replications of 1/60th acre of each sub-plot. In one experiment, two insecticides, parathion and DDT with three different dosages (0.025%, 0.05% and 0.1 %) at two different intervals of 11 and 22 days were applied. Effect of each treatment with 2, 3 and 5 applications were recorded on average number of white ears, average weight of grains and straw. In the other experiment, with the same three different dosages of Endrin at two different intervals (11 and 22 days) were applied. Effect of different concentrations on the yield were recorded.

Agr. 456 Alam, M. Z. and S. R. Bhuiyan. 1964. **Studies on the Biology of Rice Stem Borers in East Pakistan**. *Rev. Res. Div. Entomol.*

The biological studies on rice borers have been conducted during 1955-57. Different species of the borers have been listed and their habits and habitats and nature and extent of damage have been indicated. Brief life history of each species has been given. Seasonal history of the insect has been enumerated. Natural enemies so far recorded are listed.

Agr. 457 Alam, M. Z. 1964. **Field Tests of Insecticides Against Rice Borers in east Pakistan**. *Rev. Res. Div. Entomol.*

Field trials were conducted in Dacca Farm during 1963 on Aman rice for the control of borer larvae with Lebaycid, EPN and Folithion each with 0.1 % concentration and with four replications for each treatment, Larval mortality inside the plants at 24, 48 and 72 hours treatment were recorded. EPN at 24 hours was found superior to all others but its action was found gradually to diminish. Lebay-cid at 24, 48 and 72 hours after spray was almost constant. The effect of Folithion was little less than that of Lebaycid.

Agr. 458 Alam, M. Z. and S. R. Bhuiyan. 1964. **Studies on the Biology of Rice Mealy Bug. *Ripersi4 Oryzae* Green (Coccidae : Hemiptera) in East Pakistan**. *Rev. Res. Div. Entomol.*

The rice mealy bug, *Ripersia oryzae* G, (Coccidae : Hemiptera) is an important pest of rice mostly Aus crop in East Pakistan. During 1957-58 some studies on its biology were conducted. The nature and extent of damage due to the pest have been enumerated. Duration of different stages has been given. Facundity of the pest has been stated. Influence of temperature has been enumerated. The natural enemies so far recorded have been enlisted.

Agr. 459 Alam, M. Z. and S. Alam. 1964. **Notes on Biological Studies of Rice Leaf-Roller, *Cnaphalocrosis Medinalis* Guenee in East Pakistan.** *Rev. Res. Div. Entomol.*

The rice leaf-roller, *Cnaphalocrosis medinalis* Guenee (Pyralidae : Lepidop-tera) is a pest of major importance causing considerable damage to rice leaves in East Pakistan. During 1957-58 some studies on its biology were conducted. Its feeding habits, nature of injury and extent of damage have been enumerated. The different stages and their external morphology have been described. Seasonal history has been enumerated and the natural enemies of the insect has been enlisted.

Agr. 460 Alam, M. Z. and M. Shahiahah. 1964. **On the Biology of Rice Moth, *Sito-Troga Cerealella* Olivier (Galechii-Dae : Lepidoptera) In East Pakistan.** *Rev. Res. Div. Entomol.*

The rice moth, *Sitatroga cerealella* 01. is a serious pest of stored rice. During 1961-62 different aspects of its biology were studied. The role of moisture for the breeding of the insect has been enumerated. The distribution of the pest has been given. Feeding habits, nature of injury and extent of damage have been stated. Different stages have been described. Seasonal cycle has been enumerated. The natural enemies have been listed. Influence of the abiotic factors have been stated.

Agr. 461 Alam, M. Z. 1964. **Control of Rice Stem Borer With Dipterex.** *Rev. Res. Div. Entomol.*

An experiment was conducted during 1957 in a plot of 1/3 of an acre in the East Pakistan Agricultural Institute Farm Dacca. 0.1 percent Dipterex was sprayed in the transplant Aman crop which had normal infestation of rice stem borer. After 43 hours some plants showing dead hearts were taken out of the plot and dissected in the laboratory. 27 cases of plants showing dead hearts were examined and 18 cases were found to contain stem borer larvae. 62.6 per cent of the larvae found dead.

Agr. 462 Alam, M. Z., A. Ahmed and S. Ali. 1964. Field Test of Insecticides Against Rice Borers in East Pakistan. *Pakistan J• Sci. 16 (5).*

Three experiments have been conducted on Aman rice in three different places near about Dacca Farm. In the first experiment, plots were treated with Dimecron and Diazinon 0.075% and Sevin 0.117%. The mortality percentages of borer, larvae in the plots treated with Dimecron and Diazinon were 84.2 and 51.1 but that of Sevin was only 25, 72 hours after spray. In the second experiment Endrin and Telodrin 0.1 % and Phosdrin 0.6% were applied. After 72 hours of spary Phosdrin, Endrin and Telodrin gave larval mortality of 45%, 41.7% and 25% respectively. In the third experiment Lebaycid 0.1% and EPN and Folithion 0.15% were treated. EPN had been found superior to

L.baycid and Folit-hion. In all the three experiments it was assessed that Dimecron gave the most promising results, and next Diazinon gave the second promising results.

Agr. 463 Alam, M. Z. 1964. **Insect Pests of Rice in East Pakistan.** *Proc. Symp. IRRI. Dacca.*

Insect pests cause severe losses each year in rice in Pakistan. 23 species of insect pests have been recorded and listed and 14 of these are considered as major pests which are described with their distribution, feeding habits, nature and extent of injury and different stages of life histories.

Agr. 464 Hazarika, S. H. and A. Sattar. 1964. **On the Control of Rice Hispa, *Hispa Armigera* Ol.** *Rev. Res. Div. Entomol.*

A series of experiments was conducted with BliC and **DDT** with three different concentrations of 0.025, 0.05 and 0.1 per cent and Folidol E-605 and Systox with the concentration of 0.01, 0.02 and 0.02 per cent for the control of adult hispa and their grubs. All the insecticides were effected against adult hispa and their grubs inside the leaves. Systox and Folidol appeared to be more effective than BHC and **DDT** even with the lowest concentration but took longer time to kill.

Agr. 465 Alam, M. Z. and S. Alam. 1965. **A Report on Parasites on Rice Leafroller, *Cnaph, Illocrosis Medin. Ilis* Guenee.** *Annu. Rep. Dir. Entomol.*

During the biological studies of rice leaf-roller *Cnaphalocrosis medinalis* G. a few parasites has been recorded.

Agr. 466 Alam, M. Z. and A. Ahmed. 1965. **Bidrin, Dimecron and Lebaycid for the Control of Rice Borer in East Pakistan.** *17th Pakistan Sci. Conf. Karachi.*

The rice borer, Tryporza (—*Schoeno-bius*) *incertulas* (Walker) Pyralidae : Lepi-doptera) is a common and old enemy of rice in South-East Asian countries. It is also one of the most important pests of rice in East Pakistan causing serious damage to the rice crops. The Aman rice is more destroyed than Aus. Conservative estimate of loss in yield to be expected in the field, ranging from 3 % to 20% annually. Field tests with three Organ°. phosphorus compounds viz. Bidrin-0.04% Dimecron-0.05 % and Lebaycid-0.05 were carried out on transplant Aman crop during September and October, 1964. In the experiment the insecticides tested were all effective against the pest. However, Dimecron was found superior to other insecticides. Bidrin was found superior to Lebaycid. The mortality percentage after 72 hours of the treatment was found to be 75% and 41.2% in case of Dimecron, Bidrin and Lebaycid respectively. The relative effectiveness of the insecticides appeared to have been more or less influenced by population density of rice borer, local climatic factors and agricultural practices.

Agr. 467 Alam, M. Z. and A. Ahmed. 1965. **The Control of Rice Hispa with some Modern Insecticides in East Pakistan.** *17th Pakistan. Sci. Conf. Karachi.*

In 1964, studies were made in Joydeb-pur and Savar areas and near about Dacca Farm to evaluate the effectiveness of Bidrin, Lebaycid and Folithion for controlling rice hispa, *Ilispa armigera* Olivier. Results on the effectiveness of the chemicals showed that all the insecticides can effectively control rice hispa. Although Bidrin has an excellent immediate effect within 24 hours of treatment but has less residual effect. Lebaycid and Folithion have longer residual effects as population of the pest appears after three days of treatment in the Bidrin treated plot whereas Lebaycid and Folithion treated plots show reinfestation after 7 days of treatment.

Agr. 468 Bhuiyan, N. I. 1965. **Effectiveness of Bidrin in Controlling Rice Stem Borer in Aman Rice.** *Res. Rep. Burmah Eastern Ltd. (Shell oil Co.). Dacca. 3 p.*

Comparisons of 2 sprays of Bidrin at 2 weeks interval at low concentrations were made with one spray of high concentration at 4 weeks interval in Aman season, 1965. It appeared that Bidrin at 0.136% sprayed at 2 weeks interval gave equally good protection as 0.2% or higher concentrations sprayed at 4 weeks interval.

Agr. 469 Khan. D. U. and K. A. Ahmad. 1965. **Experiment Against Rice Hispa (*Hispa Armigera*) with Folithion by Beaver Aircraft.** *Proc. 17th Pakistan Sci. Conf. Abs. A-32-33.*

Rice hispa is a serious pest of Aus paddy but it also occurs on- Boro paddy and Aman paddy. An experiment was conducted to test the efficacy of Folithion 50 %EC, against this pest on Boro paddy at Mirpur Farm, Dacca. The insecticide was used at the rate of 1 lb. a. m. mixed in one gallon of water per acre. The size of plot in which observations were recorded 1/50th of an acre, which was replicated thrice. The spraying was carried out with the help of a Beaver aircraft flying 6 to 8 feet above crop level at a speed of 95 miles per hour. The wind velocity was 7 miles per hour. Insect counts taken before and after 24 hours of treatment show that the treatment has resulted in 100% mortality of adult beetles. No observations were however recorded on grubs but examination of a few mined leaves from the treated plots showed that the grubs were dead. Further trials will be conducted to test the efficacy of this insecticide on grubs through aerial spraying.

Agr. 470 Khan. D. U. and K. A. Ahmad. 1965. **Some Toxicological Studies Against Rice Hispa (*Hispa Armigera*).** *Proc. 17th Pakistan. Sci. Conf. Abs. A-32.*

An experiment was laid out at S. M. Farm, Mirpur, Dacca, during March 1964 to test the efficacy of Sumithion 50 %EC, Folithion 50%EC and Cela 1942 50 %EC, against rice hispa (*Hispa armigera*) on Boro paddy. Each insecticide was tried in the dosages of 8 oz and 12 oz a. m. per acre and each treatment was replicated thrice. The size of each plot was

436 sq. ft. The plots were sprayed with a Solo Knapsack power sprayer at the rate of 5 gallons of the solution per acre. Insect population was counted just before application of insecticides in each plot as well as after 24 hours, 48 hours, 72 hours and 96 hours of treatment. Observations were recorded for the mortality of adults and larvae separately which show that Sumit-hion 50%EC, Folithion 50 %EC and Cela 1942 50%EC when sprayed at the rate of 8 oz a. m. per acre, gave 85%, 85 % and 79. 6% kill of adults and 90%, 90% and 13.3 % kill of grubs, respectively, after 24 hours of treatment. These insecticides when sprayed at the rate of 12 oz a. m. per acre gave 88%, 97% and 84% kill of adults and 93.3%, 96.6% and 40% kill of grubs, respectively, after 24 hours of treatment.

Agr. 471 Khan, D. U. 1965. **Preliminary Trials Witw Folithion and Leimycid Against Rice Hispa.** *Proc. 17th Pakistan. Sci. Conf. Abs. A-31.*

Folithion and Lebaycid both in the concentration of 0.15% were tried during April, 1963, in a paddy field near Dacca which was heavily infested with hispa (*Hispa armigera*). There were three randomized plots (2 treatments and one control) each of which were replicated thrice. The size of each plot was approximately 1/100th of an acre. Spraying was carried out with the help of a hand knapsack sprayer. Observations on the mortality of grubs were recorded after 24 hours of treatment by taking 5 leaves from each of the 10 plants selected at random from each plot. The population of adults was recorded by taking 10 sweeps of hand nets from each plot. The results thus obtained show that Folithion and Lebaycid gave 89% and 50 % mortality of grubs and 88.4% and 93.2% mortality of adults hispa, respectively.

Agr. 472 Khan, D. U. and K. A. Ahmad. 1965. **A Comparative Study on the Effect of Folithion, Sumithion, Malathion, Sevin, AC-13 and Cela 1942 on the Adults of Rice Hispa.** *Proc. 17th Pakistan. Sci. Conf. Abs. A-32.*

Rice hispa (*Hispa armigera*) is the most serious pest of paddy crop in East Pakistan. It takes 10-65% tool of this crop every year. T6 find out an effective control of this pest a field test was carried out on Boro paddy at Baliarpur, Mirpur, Dacca during March, 1964, with Folithion 50%EC, Sumithion 50 %EC, Malathion 50 %EC, Sevin 85%SP, V.C-13 75%EC and Cela 1942 50%EC. Thus there were seven plots including control which were replicated twice. The size of each plot was $\frac{1}{50}$ th of an acre. The dose of each insecticide was kept at 1 lb. a.m. per acre. Spraying was carried out by a Solo Knapsack Power sprayer at the rate of 5 gallons of the solution per acre. Observations recorded after 24 hours of . treatment show that Folithion 50 % EC gave excellent results by controlling 95% of the adult population. Sumithion 50%EC, Sevin 85%SP, V.C-13-75%EC and Cela 1942 50%EC, gave 85%, 50%, 50%, and 60% mortality of adults respectively, while Malathion 50% EC gave only 25 % as against no mortality in the control plot.

Agr. 473 Alam, M. Z. 1966. **Use of BHC for the Control of Rice Borers In East Pakistan.** *Annu. Rep. Div. Entomol.*

The rice borers are important insect pests and cause significant losses in Rice yields in the country. Four species of borers are responsible for this loss and those are :

1. *Tryporyza incertulas* (W.)
2. *Chilo traea auricilia* D.
3. *Chilo traea polychrysa* M. and
4. *Sesamia inferens* W.

The use of BHC presently offers- more promising result than conventional foliar treatment. It is cheap, easy to apply and has low mammalian toxicity.

Agr. 474 Alam, M. Z. 1966. **Trial of Diazinon Against Rice Hispa in East Pakistan.** *Annu. Rep. Div. Entomol.*

Diazinon, an organophosphorus contact insecticide was tested in different places in East Pakistan on adult rice hispa, *Hispa armigera* Olivier, a serious pest of rice of the province. Series of experiments were conducted in several fields on Aus, Aman and Boro rice crops during 1965. Diazinon 50 EC was used in form of spray with concentrations of 0.05%, 0.06% and 0.75% (active ingredient). In all the experiments each concentration was replicated three times including a control treatment. The experimental plot size was 33' x 33'. 20 pretreatment random samples on 20 different rice plants were taken from each of the experimental plots and the number of adult hispa per plant per sample were counted and recorded. The insecticide was sprayed by a Pneumatic Knapsack sprayer at the rate of 50 gallons per acre.

Agr. 475 Ahmed A. and M. Z. Alam. 1967. **Testing of Organo Phosphorus Insecticides, Lebaycid, Folithion and Gusathion for the Control of Rice Hispa and Rice Borers in East Pakistan.** *Bangladesh Agril. Sci. Abs. Vol. 1, 1974 M. Sc. (Ag.) Thesis. East Pakistan Agr. Univ. (MS.) 87 p.*

Considering the Le_0 as standard, the effect of all the three insecticides, Lebaycid, Folithion both at the rate of 1.25 lbs. and Gusathion at the rate of 2.0 lbs/acre had been found minimum effective damage for the control of rice hispa and stem borers.

Agr. 476 Alam, M. Z. 1967. **Further Trial of Bidrin Against Rice Hispa.** *Annu. Rep. Div. Entomol.*

Bidrin, a systemic organophosphorus insecticide had been found earlier to have a persistent effectiveness against rice hispa. In 1965, few experiments were conducted near Joydebpur and Sa-var areas to find out the effectiveness of Bidrin 0.05% (active

ingredient) against adult rice hispa and also grubs and find out the residual effect of the chemical on the rice plants. The plot size was 20' x 30' and the treatments were Bidrin and control each replicated 3 times. Bidrin 0.05% gave an excellent control of adult rice hispa with 90.9% reduction of population in the plots and for the grubs 87.5% mortality was found only due to the effect of the insecticide and the rest i.e. 12.5 % kill was recorded due to the attack of natural enemies. The effect of insecticides on rice plants was found promising upto 7 days after which insects were found to be migrated to the plots treated with insecticide.

Agr. 477 Alain. M. Z. 1967. **Rice Stem Borers in East Pakistan.** *Proc. Seminar on Insect Pest Control, Atomic Energy Centre. Lahore.*

Rice borers are major problems throughout the rice growing countries of Asia. In East Pakistan four species of rice borers, *Chilotrea* (Dudgeon), *Tryporyza incertulas* (Walker), *Seamia inferens* Walker and *Chilotrea polychrysa* (Meyer) have been recorded for causing the damage. The ratio of the four species on all crops was recorded as 13.8:7.8:3.0:0.3 for the above four species respectively. Bionomics, identifying characters, habits and nature of damage of these four species are described briefly. Recent findings and recommendations based on the trials using granular insecticides for the control of the pest have been enumerated. Recommendation on foliar application with different insecticides have been given. Cultural practices to minimise the borer infestation have also been indicated.

Agr. 478 Alain, M. Z. 1967. **Bionomics and Control of Rice Hispa.** *Proc. Seminar on Insect Pest Control, Atomic Energy Centre Lahore.*

Rice hispa, *hispa armigera* Olivier is a regular and common pest of rice of East Pakistan. Its distribution, nature and extent of damage have been briefly discussed. Life history, bionomics and habits of the insect have been briefly enumerated. Biological information of a new larval parasite has been given. Recommendation of insecticidal control measures have been given on the basis of the results obtained from the field experiments conducted during last three years.

Agr. 479 Alam. M. Z. 1967. **Special Problem of Insect Pest Control in Pakistan with Respect to Rice Gall Midge.** *Proc. Seminar on Insect Pest Control, Atomic Energy Centre, Lahore.*

The rice gall midge, *Pachydiplosis oryzae* (Wood-Mason) has posed a threat for growing high yielding miracle rice, 1RR1 varieties in East Pakistan. The stem of the young rice plant instead of growing normally is converted into a hollow, long, pale gall or tube due to the attack of the pest. The formation of the gall due to irrigation caused by minute maggot feeding inside the growing point in the stem. The formation of the gall prevents the formation of ear head. Taxonomy and nomenclature, a short history of the gall midge, distribution, host plants, the gall

and its anatomy have been described. The biology of the pest has been worked out. Some recommendations for the control of the pest have been made on the basis of the results achieved from the field experiments conducted during 1966.

Agr. 480 Alam, M. Z. and A. Ahmed. 1967. **Bioassay of the Relative Contact Toxicity of Some Modern Insecticides to Adult Rice Hispa.** *Proc. 18th and 19th Pakistan Sci. Conf. Jamshore.*

A comprehensive Bioassay test of 25 different insecticides (name given below in groupings) was carried out in Dacca Farm during March, 1965. Rice hispa, *Hispa armigera* Oliver (Hispidae ; Coleoptera) was selected as a test insect due to its abundance on rice crops. The insecticides used were commercial formulations of different pesticide firms and the concentration of each insecticide was calculated on the basis of active ingredient present in the formulations. An optimum concentration of 0.05% was taken into account for the experiment. The experiment was conducted in the insectory, Dacca Farm putting the adult insects (10) in glass chimneys dipped in insecticides. Each chimney was covered with one petridish at the bottom and the other at the top. The petridishes were also ringed with insecticides. Each concentration was replicated 5 times. The deposit of insecticidal film covered internal side of each chimney and the inner side of two petridishes were calculated and found to be 3.022 mg/sq. cm. The observations were recorded for the assessment to toxic effect and time required for counts of 50% and 100% mortalities. The mortality counts were subjected to probit analysis. The values of relative toxicity of different insecticides have been calculated by taking LC₂₀ value of Lindane (gamma BHC) as unit.

Agr. 481 Khan, R. U. and M. Z. Alam. 1967. **Trials of Systemic Organophosphorus Insecticides, Dimecron and Carbicron for the Control of Rice Hispa and Winter Aphids in East Pakistan.** *M. Sc. (Ag.) Thesis. East Pakistan Agr. Univ. (MS).*

Recommendations based on the basis of the yield experiments conducted during the years 1965-66 and 1966-67 showed that 4 ounces active materials of Dimecron and Carbicron effectively control rice hispa, *Hispa armigera* Olivier and 4 ounces active materials of the same insecticides could easily control the winter aphids on Mustard and country bean, *Lipaphis pseudo-brassicae* (Davis) and *Aphis rnedicarginis* Koch respectively in East Pakistan.

Agr. 482 Alam, M. Z. and M. Abbas. 1963. **Foliar Application of Insecticides on IRRI Aman for the Control of Rice Borers in Joydebpur Farm, Dacca.** *Ann. Rep. Div. Entomol.*

Field experiments were conducted in Joydebpur Rice Research Farm in 1967 on IR8-288-3 grown as T. Aman with foliar application of Thiodan, Bidrin, Lebaycid and Sumithion to assess their effectiveness in minimising the infestation of rice borers and also on the yield of grains. Four treatments of Thiodan 35 EC, Bidrin 85 W/M, Lebaycid 50

E and Sumithion 50 EC, were given at the rate of 2.5, 8.75, 1.5 pounds per acre respectively. The first treatment was applied three weeks after the transplantation and subsequent treatments were given at an interval of 15 days. The last or fourth treatment was applied prior to booting stage. The decrease in infestation in the treated plots over the control plots were 96.8%, 85.9%, 81.1% and 77.5% and the increase in yield in treated plots over the control plots were found 8.13, 7.9, 4.8 and 3.0 maunds per acre for Thiodan, Bidrin, Lebaycid and Sumithion respectively.

Agr. 483 Alam, M. Z. 1968. **Influence of Temperature of Embryonic Development of the Rice Ear-Cutting Caterpillar, *Pseud.4l-Etia Unipuncta* (Haworth).** *Proc. 20th Pakistan Sci. Conf. Dacca.*

Experiments were carried out to find out the influence of temperature on embryonic development of the eggs of rice ear-cutting caterpillar, *Pseudaletia unipuncta* (I-1.). The eggs were incubated at different temperatures of 10°, 15°, and 30°C in temperature cabinets. The effect of various temperatures on the development of embryo has been recorded. A key to embryonic development at 30°C has been given.

Agr. 484 Alam, M. Z. and F. M. M. Zaman. 1968. **Studies on the Effect of Temperature on the Developmental Stages of Khapra Beetle, *Trogode-Rma Granarium* E.** *Proc. 20th Pakistan Sci. Conf. Dacca.*

The Khapra beetle, *Trogoderma grana-rium* Everts (Dermestidae : Coleoptera) is a major pest causing considerable damage to stored wheat and husked rice and to a lesser extent maize, grains and pulses in East Pakistan and many foods in the tropics. Temperature has direct correlation in the development stages and also the rate or infestation of the pest. To determine the effect of temperature on the pest, experiments were conducted over a range of constant temperature of 85°F, 93°F and 105°F. The infestation generally appears when temperature 80°F to 105°F. But favourable temperature occurs between 80°F to 95°F. Higher temperature shortens the life cycle whereas cold and high percentage of humidity lengthens it. June to October is the pick period of the pest.

Agr. 485 Alam, M. Z. 1968. **Notes on the Rearing of Rice Ear-Cutting Caterpillar, *Pseud Ilet1-1 Unipuncta* (Haworth) on Artificial Diet.** *Proc. 20th Pakistan Sci. Conf. Dacca.*

During the laboratory study of rice ear-cutting caterpillar, *Pseudaletia unipuncta* (Haworth) (Noctuidae : Lepidoptera), an artificial medium of wheat germ was prepared for rearing the insect from larvae to pupae. The medium has wheat germ meal as the primary constituent but also contains vitamin-free casein, sucrose, wesson's salt, choline chloride, ascorbic acid, agar, potassium sorbate, methyl methyl parahydrox benzoate and water. Laboratory rearing experiments were conducted during 1964 and 1965. Due to such rearing on artificial diet, emergence of adult moths was with a range of 32% to 68% while the normal rearing only within the range of 13% to 31%.

Agr. 486 Alain, M. Z. 1968. **Control of Insect Pests of IRRI Rice in East Pakistan.** *Proc. 20th Pakistan Sci. Conf. on IRRI Rice. Dacca.*

Five granular insecticide, viz., Dol granule and Sevidol each @ 30 lbs. and Diazinon IOG 15 lbs. per acre and Dipterex 2.5G @ 1.3 lbs. active material per acre were used in the field trials for the control of borers as well as to minimize the incidence of other pests. The treatments were applied on Aman IRRI-8 in a randomized block design replicated three times on 1/40th of an acre of each subplot. First treatment applied at 30 days after transplantation and two further subsequent treatments were applied at 30 days interval. Diazinon 10G gave the best result, and Sevidol and Dol granule gave better results than other two.

Agr. 487. Alam, M. Z., M. A. Sattar and F. M. M. Zaman. 1968. **Foliar application of insecticides on irri aus for the control of rice borers and gall fly in com-illa.** *Proc. 20th Pakistan Sci. Conf. Dacca. Bangladesh Agril. Set. Abs. Vol. 1, 1974*

Field experiments were performed in Comilla Agricultural Research Sub-station in 1967 on IRRI-8 grown as Aus with foliar application of Bidrin, Lebaycid, Sumithion and Thiodan to assess their effectiveness in minimizing the infestation of rice borers and gall fly and also on the yield of grains. Three treatments of Bidrin 85 W/M, Lebaycid 50 EC, Sumithion 50 EC and Thiodan 35 EC were given at the rate of 0.75, 1.5, 1.5 and 2 pounds per acre respectively. The first treatment was applied three weeks after transplantation and the subsequent second and third treatments were given at an interval of three weeks. The last or third treatment was applied just prior to booting stage. All the insecticides were found significantly effective in reducing the infestation of both the pests as compared with that of control plots. Significant higher yield of grains were obtained in treated plots than that of control plots. In order of merits of the insecticides, they are Bidrin, Thio-dan, Lebaycid and Sumithion.

Agr. 488 Alam, M. Z. 1968. **Control of insect vectors to minimise 'tungro' disease on irri varieties of rice.** *Proc. 20th Pakistan Sci. Conf. Dacca.*

With the introduction of IRRI rice, the incidence of 'Tungro' virus disease was gradually increasing in East Pakistan since 1966 and the disease appeared seriously on Aus and Aman of 1967. In recent years, the disease has been described to be transmitted by leaf hoppers. In East Pakistan it has been recorded that there are four species of leaf hopper viz., *Nephotettix bipunctatus* Fb. *N. apicalis* M., *Selenocephalus virescens* D. and *Sogatia distincta* D. of which the first three species may be responsible to transmit the Tungro virus. This paper describes experiments to devise technique for protecting the rice crop (IRRI varieties) from the vectors and thus prevent the spread of the disease.

Agr. 489, Kabir, S. M. H. 1968. **Insect pests of rice in east pakistan and their control.** *PANS. Sec. A. 14 (2) : 244-247.*

The total annual loss by rice pests had been estimated to reach about 15 per cent. Twelve

species of insects were found to be major- pests in East Pakistan. Spraying with gamma-BHC 20% W. P., Azodrin 60% W. V., Bidrin 85% W/V. and Diaz-inon 60% W/V EC at the rate of 2.5, 0.75, and 1.25 lbs./acre respectively, had been found promising in controlling borers. Gamma-BHC and Carbaryl (Sevin) at the rate of 2.5 and 2 lbs./acre, respectively, had been found effective in controlling rice leaf feeders. Spraying the rice IS0 Food Crops field with 0.05% Bidrin, Azodrin, Phos-phamidon (Dimecron) and 0.075 % Fenitr-othion (Folithion) and Diazinon considerably reduced the sap-sucking insect population.

Agr. 490 Kabir. S. M. H. 1968. **Effect of habitat disturbance on the interactions of the populations of rice weevil, *sitophilus ze,4-mais* mots. And lesser grain borer. *Rhizopertha dominica* (fab.).** *Pakistan J. Sci.* 20 (5-6) : 262-265.

The effect of habitat disturbance on the interactions of the rice weevil *Sit-ophilus zea-mais* Mots. and the lesser grain borer *Rhizopertha dominica* (Fab.) was studied in the laboratory under controlled condition of food and space limitations and at a temperature of 20+5% relative humidity. The population level of the weevil either living alone or together with grain borer was higher in disturbed grain. Disturbance or non-disturbance of the habitat was more important for the weevils than the interactions with grain borers. The grain borers suffered adversely when living with the weevils in both habitat conditions. The population level of the grain borer when reared alone in disturbed habitat was significantly higher than its population levels either living alone in undisturbed habitats. An undisturbed habitat did not provide an environment favourable for insect development.

Agr. 491 Abbas, M. and M. Z. Alam. 1969. **Studies on the effect of granular insecticides, diazinon mg and sevidol for the control of rice borers and on the yield of grains on irri variety (ir8-288-3).** *M. Sc. (Ag.) Thesis. East Pakistan Agr. Univ. (MS).* 108 p.

Experimental results showed that Dia-zinon 100 at the rate of 20 1 bs/acre at 21-day intervals consistently provided the best control of rice borers and produced highest grain yield followed by Sevidol at the rate of 40 lbs/acre at 21-day intervals. The poor results were obtained from Diazinon 50 EC.

Agr. 492 Alam, M. Z. 1969. **Granular application on irri aus for the control of rice borers and leaf roller at the central agricultural research station, joydebpur.** *Annu. Rep. Div. Entomol.*

Field experiments were conducted at the Central Agricultural Research Station, Joydeopur in' 1968 on 1R8-288-3 and grown as Aus with Diazinon 10G, Sol-vigam 8G, Lebaycid 5G and Gusath-ion 5G to assess their effect in minimizing the infestation of rice borers, *Tryporyza incertulas* (Walker) and *Chil-otraea auricilia* (Dudgeon) and rice leaf roller *Cnaphalocrosis medinalis* Guenee and also on the yield of grains. Two application of Diazinon 10G, Solvigam 8G, Lebaycid 5G and Gusathion 50 were given at the rate of 15, 25, 30, 30 pound

per acre respectively. The first application was given one month after the transplantation and the next application was given one month after the second application. The decrease in infestation in the treated plots over the control plots were 88.02%, 69.49%, 50.18 % and 48.8 % for rice borers and 67.48%, 72.96%, 58.97% and 44.75% for leaf roller with Diazinon, Solvigam, Leb-aycid and Gusathion respectively. The plots treated with Diazinon gave the highest yield, 60.5 maunds per acre; the plots treated with Solvigam, Lebaycid and Gusathion gave 59.50 58.25 and 52.15 maunds per acre respectively, whereas the control gave only 48.75 maunds per acre.

Agr. 493. Alam, m. Z. 1969. **On the incidence and control of rice thrips, *thrips oryzae walker*.** *Annu. Rep. Div. Entomol.*

Records on the incidence of rice thrips, *Thrips oryzae W.* were made during 1968 and 1969 on Boro paddy near Mirpur, Dacca A few field trials were conducted for its control with Malathion, Bidrin, Dimecron Sevin and Thiodan with 0.05 % concentrations were found most effective. Lebaycid and Folithion with 0.075% concentrations were also effective.

Agr. 494. Alam, M. Z. 1969. **Further trial of thiodan against the grub of rice hispa in east pakistan.** *Annu. Rep. Div. Entomol.*

In 1967, studies were made in Joydeb-pur areas to evaluate the effectiveness of Thiodan, also known as Eudosulfan, for controlling the grubs of rice hispa, *Ilispa arnigera* Olivier on Aus rice crops. Series of experiments were conducted in each of the areas using 0.03% and 0.06% of Thio-dan. In all the experiments each of the concentrations was replicated three times keeping a set for the control plots. The size of each treatment in all the experiments was 20' x 30'.

Agr. 495 Alam, M. Z. 1969. **Control of lisect pests of rice in east pakistan.** *Annu. Rep. Div. Entomol.*

Among the granule, Dol granule and Sevidol each at the rate of 30 lbs per acre and Diazinon 10G and Phosvel 10G each at the rate of 15 lbs. per acre and Dipterex 3G at the rate of 50 lbs. per acre were applied, three treatment were given at 30 days interval after transplantation. Diazinon gave the highest yield with minimum infestation and next Dipterex, Sevi-dol and Phosvel rated the second. Dol granule minimised the infestation upto the mark but could not increase the yield as other did. Foliar applications were treated with Carbicron, Bidrin, Dimecron, Thio-d an, Diazinon, Folithion and Sumithion at the rate of 12 oz. active material per acre for the control of borers and other surface insects. Sevin at the rate of 2 lbs, active material per acre used for surface insect control. DDVP at the rate of 8 oz, active material per acre have been proved effective in controlling rice ear-cutting caterpillar.

Agr. 496 Alain. M. Z. and A. Ahmed. 1969. **Field tests of organophosphorus insecticides, lebaycid, folithion and gusathion for the control of rice borers in east pakistan.** *Pakistan J. Sci. Res.* 21 (3-4).

Field experiments were conducted in 1966 on transplanted Aman rice in Savar, Dacca with organophosphorus insecticides, Lebaycid, Folithion and Gusathion. The tests were conducted in factorial experiments with randomized complete block design having three replications per treatment of each dosage. Four dosages of treatment (1, 1.25, 1.5 and lbs. a. m. per acre) were used. The plot size was 1/40th of an acre. Mortality record was done by dissecting the dead hearts taken at random from each plot at an interval of 2, 4, 6, 8 and 10 days after spray. The data were analysed statistically and interpreted on the efficacy of treatment on larval mortality of the pest. It is concluded that all these three insecticides were effective to control rice borer larvae at the rate of 1.25 lbs Lebaycid and Folithion and 2 lb. Gusathion per acre.

Agr. 497 Alain. M. Z. 1969. **Control of insect pests of IRRI Rice in East Pakistan.** *Pakistan, Karachi.*

With the introduction of IRRI rice, the incidence of insect pests were gradually increasing in East Pakistan since 1969. Field trials for the control of major insect pests on IRRI varieties were conducted with granular as well as foliar insecticides and the results were summarised.

Agr. 498 Muslehuddin, M. and M. Z. Main. 1969. **Studies on the Biology of Rice Gallmidge, *Pachymylos oryzae* (Wood-Mason) (Cecidomyiida: Diptera) in East Pakistan.** *M. Sc. (Ag.) Thesis. East Pakistan Agr. Univ. (MS).* 63 p.

The adult fly was about a size of a mosquito, nocturnal and phototropic in habits. Life cycle was completed from 29 to 38 days. The IRRI varieties (IR-5 and IR-8) appeared to be more susceptible than those of local varieties. The initial infestation of rice gall midge started on Boro (IR-8) from April and population reached peak period during the month of June and July when heavy rainfall occurred during Aus season.

Agr. 499 Sattar, A. and A. Ahmed. 1969. **Determination of Residual Value of Bidrin, Dimecron and Sumithion in Transplant Aman Paddy Applied after 50 and 70 Days of Transplantation.** *M. Sc. (Ag.) Thesis. East Pakistan Agr. Univ. (MS).* 109 p.

The residual value of three organo-phosphorus insecticides, Bidrin, Dimecron and Sumithion were determined to find the effective control of insect pest avoiding associated hazards. It was found that the rate and progress of degradation of all

three organophosphorus insecticides were very high. There appeared to exist no potential difference among Bidrin, Dimecron and Sumitbion in respect of retention of their residue *in* rice plant. High temperature and rainfall after application were found to cause rapid loss of insecticides as well as their residue.

Agr. 500 Alam, M. Z. and A. Ahmed. 1970. **Testing of Some Foliar Insecticides for the Control of Rice Borers on Ir.3 Boro at Hathazari.** *Annu. Rep. Div. Entomol.*

Eight foliar insecticides, viz., Agro-thion, Azodrin, Bayrosil, Diazinon, Elsan, Padan, Phosvel and Zolone were under field trial against rice borers on IR-8 grown as Boro at Agricultural Research Sub-station, Hathazari in 1969. The insecticides were applied at the rate of 0.75 lbs. active material per acre. The first application was given 30 days after transplantation and the subsequent treatments at an interval of 15 days. The percentage infestation in the treated plots showed minimum ranging from 1.33 to 1.90 per cent whereas the percentage of infestation in the control plot was 4.80. Maximum average yield was achieved in the plots treated with Diazinon. Next promising results were obtained with Zolone, Phosvel, Elsan, Padan and Azodrin. Others were inferior.

Agr. 501, Alam, M. Z. and A. Ahmed. 1970. **Control of Rice Borers on Ir-8 Aus With Fourteen Insecticides in 1969 at Hathazari.** *Anon. Rep. Div. Entomol.*

Field trials were conducted with fourteen foliar insecticides, viz., Ambithion, Azodrin, Cidial, Diazinon, Elsan, Gardona, Imidan, Nuvacron, Padan, Phosvel, Sevin, Uden, Supracid, and Zolone at the rate of 0.75 lbs. active material per acre for the control of rice borers on IR8 grown as Aus in 1969 at the Agril. Research Sub-station, Hathazari. The first application was given 30 days after transplantation and the subsequent two treatments were, applied at 15 days interval. After harvesting the crop the results were recorded and analysed. The percentage of infestation in the treated plots showed minimum ranging from 1.72 to 2.30 per cent whereas in the control plot showed 8.65 per cent infestation. Diazinon proved best regarding per cent increase in yield followed by Uden, Padan, Azodrin, Elsan, Imidan and Cidial. Others showed inferior results.

Agr. 502, Alam, M. Z. and A. A. Ahmed. 1970. **Field Trial With Eight Foliar Insecticides for the Control of Rice Borers on Ir.20 Aman In 1969 at Jamalpur.** *Annu. Rep. Div. Entomol.*

Field trials were conducted with eight foliar insecticides viz., Azodrin, Diazinon, Imidan, Padan, Polwadofos, Sevin, Uden and Zolone at the rate of 0.75 lbs. active material per acre for the control of rice borers on IR-20 grown as Aman in 1969 at Agricultural Research Sub-station, Jamalpur. The first treatment was given 30 days after transplantation and the subsequent three treatments at an interval of 15 days. After harvest the results were recorded

and analysed. The treated plots showed minimum infestation ranging from 1.82 to 2.23 per cent whereas control plots showed 8.70 per cent infestation. As regards increase in yield Diazinon proved best and next to it Uden, Azodrin, Imidan gave the promising results. Others showed inferior results.

Agr. 503, Alam, M. Z. and A. Ahmed. 1970., **Foliar Application For The Control of Rice Borers on AUS at Jamalpur.** *Annu. Rep. Div. Entomol.*

Four foliar insecticides, viz. EPN, Nexagon, Polwafos and Sevin were tested for the control of rice borers on Aus at Agricultural Research Sub-station, Jamalpur in 1969. The insecticides were applied at the rate of 0.75 lbs. active material per acre. The first application was given 30 days after transplantation. Subsequent two treatments were given at 15 days interval. After harvest the results were recorded and analysed. The percentage of infestation was minimum in the treated plots ranging from 3.21 to 4.00 per cent whereas the percentage of infestation was 9.75 in the control plot. All the four insecticides were found equally effective as regards increase in yield over the control.

Agr. 504 Alam, M. Z. and A. Ahmed. 1970. **Testing of Four Foliar Insecticides Against Rice Borers on Ir.-8 Aus In 1969 at Chapai Nawabganj.** *Annu. Rep. Div. Entomol.*

Four foliar insecticides, viz. Nuvacron, Elsan, Accothion and Padan were tested for the control of rice borers on IR-8 grown as Aus at Chapai Nawabganj in 1969. The dosage rate was 0.75 lbs. active material per acre. The first application was 30 days after transplantation and the subsequent two applications were given at an interval of 15 days. After harvest the results were recorded and analysed. The percentage of borer infestation ranged from 2.00 to 2.72 whereas in the control plots it was 8.20 percent. The results showed that all the insecticides were also equally effective as regards increase in yield over control.

Agr. 505. Alam, M. Z., A. Ahmed and S. A. Chowdhury. 1970. **Testing of Some Foliar Insecticides for the Control of Rice Borers on Ir-20 Aman in 1969 At Jessore.** *Annu. Rep. Div. Entomol.*

Seven foliar insecticides, viz., Azodrin, Diazinon, Gusathion, Nexagon, Padan, Phosvel and Zolone were tested against rice borers on IR-20 grown as Aman at Jessore in 1969. The rate of application was 0.75 lbs. active material per acre. After 30 days of transplantation the first treatment was given and the subsequent three treatments were given at 15 days interval. After harvest the results were recorded and analysed. The percentage of borer infestation ranged from 1.48 to 2.01 in the treated plots as against 7.90 in the control plots. The best result was

obtained with Diazinon as regards increase in yield over control. Next promising results were obtained with Padan, Phos-vel and Gusathion. Rest showed poor results.

Agr. 506. Alam, M. Z., A. Ahmed and S. A. Choudhury. 1970. **Trial of Some Foliar Insecticides For The Control of Rice Borers on ir-8 Boro In 1969 at Jessore.** *Annu. Rep. Div. Entomol.*

Six foliar insecticides, viz., Ambit-hion, Bayrosil, Diazinon, Gusathion, Po-wadofos and Supracid were under field trial on IR-8 grown as Boro at the Agricultural Research Sub-station, Jes-sore in 1969. The rate of application was 0.76 lbs. active material per acre. After 30 days of transplantation the first treatment was applied and the subsequent three treatments were given at 24— 15 days interval. After harvest the results were recorded and analysed. The percentage of borer infestation ranged from 1.34 to 2.67 in the treated plots as against 8.71 in the control plots. As regards increase in yield Diazinon proved to be the best. Next promring results were obtained with Polwadofos and Bay-rosil. The rest showed inferior results.

Agr. 507 Alam, M. Z. and A. Ahmed. 1970. **Effectiveness of Seven Foliar Insecticides for the Control of Rice Borers at Jamalpur.** *AIM Rep. Div. Entomol.*

Field trial was coudutced with seven foliar insecticides, viz., Gardona, Mal-athion, Phosvel, Polwadofos, Supracid, Unden and 6860 to compare the effectiveness of these insecticides in controlling the rice borers on IR-8 grown as Boro in 1969. The insecticides were used at the rate of 0.75 lbs. active material per acre. 30 days after transplantaion the first treatment was applied. The subsequent three treatments were applied at an interval of 15 days. After harvest the results were recorded and ansalysed. The treated plots showed minimum infestation ranging from 1.64 to 2.8 per cent. The percentage of infestation in the control plots was 8.66. Diazinon proved to be the best as regards increase in yield per acre over control. The next good results were achieved with Phosvel, Unden, and Polwadofos. Others showed inferior results.

Agr. 508. Alam, M. Z. and M. Abbas. 1970. **A Comparative Study of Granular Diazinon and Sevidol and Foliar Diazinon for the Control op Borers on Irri Rice in East Pakistan.** *PANS 16 (3).*

In East Pakistan the average yield of rice is as low as 19.64 maunds per acre to which pests and diseases make a major contribution. Of the insect pests, the rice borers is one of the most serious and widely distributed. From November 1967 to December 1958 a series of field trials was conducted in which DiazinOn 10G and Sevidol granules were compared with foliar application of Diazinon 50EC for the control of rice borers on IR-8 grown as Born, Aus and Aman crops in Joydedpur Farm. The results recorded and summarize whe-rein cost benefit analysis of the various treatments confirmed the superiority of the granular insecticides. Diazinon 50 EC could not compete with other in terms of effectiveness or cost benefit ratio. It

is concluded that granular formulations should be applied only to high yielding varieties grown under controlled irrigation. This limitation does not apply to foliar applications.

Agr. 509 Alam, M. Z. and Moslehuddin. 1970. **Studies on the Biology of Rice Gall Midge, *Pschydiplosis Oryzae* (Wood-Mason), In East Pakistan.**

Pakistan J. Zool. 2 (1).

The rice gall midge, *Pschydiplosis oryzae* (W-M) has become a serious pest of rice in East Pakistan. The initial infestation occurs in the seedling stage. The larvae of the insect cause damage with the result that the shoot of the rice plant, instead of growing normally, is converted into a narrow hollow, long, gall tube preventing the formation of ear head. The distribution of the pest has been indicated and the nature and extent of damage have been studied on two IRRI and four local varieties grown as Boro, Aus and Aman. The anatomical study of gall reveals that gall is a modified leaf sheath and not stem. The various stages of the insect have been described. One parasite has been recorded and various natural enemies so far recorded by other workers have been discussed. Studies on seasonal history also have been made and five generations of the pest in a year have been recorded.

Agr. 510. Azhar, I. and S. M. II. Kabir. 1970. **Comparative Susceptibility of Different Varieties of Rice to the Attack of Rice Weevil, *Sitophilus Oryzae* (L.) and Control of the Pests.** *M. Sc. (Ag.) Thesis East Pakistan Agr. Univ. (MS.)* 70 p.

Rice weevil was allowed to multiply in boiled and unboiled rice of different varieties under laboratory condition. Toxicological studies were also made using Malathion, Diazinon, and Dieldrin. Rice weevil grows well between 25°C to 30°C and it prefers boiled rice. Susceptibility of rice varieties depends on the quality and hardness of rice to the weevil. Diazinon was less toxic to *Tri-bolium nolitor* and Malathion to *T. castaneum*. Rice weevil was best controlled by Malathion. 20 ppm of Malathion for 48 hours exposure kills 100% of rice weevil and 97.45 % of yellow meal moth. 10 to 20 ppm of Diazinon and Malathion would be required to protect the stored grains for 3 months.

Agr. 511 Bhuiyan, N. I. and M. A. Sardar. 1970. **Varietal Susceptibility of Paddy to Rice Stemborers and their Control by Certain Insecticides.** *Res. Rep. Evaluation and Coordination Commi. Directorate Agr. Govt. East Pakistan.* 2 p.

Comparative studies on two local and IRRI-varieties were done. It was found that Latisail was less susceptible to stem borers than Nizersail and of the two IRRI-varieties, IRRI-5 was less susceptible than IRRI-140. As regards controlling rice stem borers by certain insecticides, Diazinon (0.07%) was superior to other dosages of Sumithion, Bidrin, and Sevin.

Agr. 512 Bhuiyan, N. I. and M. H. Miah. 1970. **Comparative Studies on the Susceptibility of Rice Varieties to Stem Borers and the Method of Controlling Them.** *Res. Rep. Evaluation and Coordination Commi. Directorate Agr. Govt. East Pakistan.* 2 p.

Comparative studies of both local and IRRI-varieties of rice were done in both Aus and Aman seasons. In both seasons, IRRI-8 was more susceptible to rice stem borers than the local varieties. As regards control of stem borers, seedlings treated with 0.0375% Gamma-BHC were less infested and the highest economic return in yield was obtained in IRRI-8. In seedbed treatment, high dosages of Diazinon reduced stem borer infestation, but reduced the plant heights in local varieties. Granular treatment of insecticides produced most satisfactory and spectacular results. All dosages of Sevidol and Diazinon controlled stem borers in IRRI-8 and local varieties. But the yields of IRRI-8 variety were poor in Aman Season. In local varieties, Diazinon (2.0 kg/ha). Bid-rin (1.5 kg/ha) and Sevidol (2.5 kg/ha) were quite satisfactory to have economic returns.

Agr. 513 Bhuiyan, N. I. 1970. **Effects of Gamma-Bhc and Diaz-Inon Granules in Controlling Rice Stem Borers and Leaf-Hoppers.** *Res. Rep. Evaluation and Coordination Commi. Directorate Agr. Govt. East Pakistan.* 2 p.

Both Gamma.BHC and Diazinon granules were applied to IR-8 variety at an interval of 2C days. 2.0 and 2.5 kg, ha (a.i.) of Ganarna-BHC gave a good control of stern borers during 1st and 2nd treatments after 25 days of transplantation. About 50 to 70 per cent of stem borers were controlled upto 55 days and the yield was increased by 1.0 ton/ha. Diazinon at the rate of 3.0 kg/ha (a. i.) controlled 95 stem borers and 70 % leaf-hoppers upto 45 days after transplantation and the yield was increased by 2.7 tons/ha. Gamma-BHC 2.0 or 2.5 kg/ha (a.i.) with 3 or 2 applications upto 85 or 55 days gave good protection against stem borers attack. Dia-zinon 3.0 kg/ha (a.i.) provided adequate protection with 3 applications starting from 5 days after transplantation and controlled both stem borers and leaf-hoppers.

Agr. 514. Bhuiyan N. I. 1970. **Growth Response of Rice Hispa, *Hispa Armigera* Olivier (Hispidae: Coleoptera) on Several Varieties of Rice and Grass.** *Res. Rep. Evaluation and Coordination Comrni. Directorate Agr. Govt. East Pakistan.* 2 p.

Growth, oviposition and longevity of rice hispa were studied on various rice varieties and grasses in both Aus and Aman seasons. The development from egg to adult took about 20-22 days at temperature of $28.5^{\circ}\text{C} \pm 1.5$ and R. H. 75.5% ± 5.5 in both Aus and Aman varieties of rice. Females laid more eggs on Aus varieties than on Aman ones. About 77% of the eggs hatched in 4-5 clays in both seasons. The longevity of males ranged from 14-30 days and that of females ranged from 12-28 days. Larval and pupal periods in *Echinochloa stagmina* B. were almost similar to that in rice. The average number of eggs laid in this grass were much lower than that in rice and the percentage of egg-hatch ranged from 10-20. The longevity of adults increased slightly. This grass served as alternate host

plant during the mature stage of rice. In other grasses such as, *Cyperus iria* Rottb., *Echinochloa crusgali* (Linn.) P. Beauv and *Leersia alexandra* S. W. the rate of larval and pupal mortality was very high. Adult hispa could only survive for 10-14 days in *Echinochloa crusgali* and *Leersia alexandra* and for a few days (4-5 days) on *Cyperus iria*. They did not lay any egg on them and feed temporarily.

Agr. 515. Kabir, S. M. H. 1970. **Interactions of Lesser Grain Borer, *Rhizopertha Dominica* (Fab.) and Red Flour Beetle, *Tribolium Castaneum* (Herbst) With Developmental Stages of Rice Weevil, *Sitophilus Zea-Mais* Mots.** *Sci. Res.* 7 (2-3) : 67-71.

A significant difference in the development of the rice weevil, *Sitophilus zeamais* Mots. occurred when the lesser grain borer, *Rhizopertha dominica* (Fab.) was allowed to live in the grain containing developmental stages of the rice weevil. The presence of grain borers in the weevil-infested grain caused developmental mortality of the weevils. The population development of the lesser grain borers in the rice weevil-infested grain and in the noninfested grain showed no significant difference. The presence of the red flour beetles *Tribolium castaneum* (Herbst) was not detrimental for the development of the rice weevil. Weevil-infested grain was found to be more favourable for the flour beetles than the non-infested grain.

Agr. 516 Lippold, P., G. E. Galvez-E., M. S. A. Miah and M. S. Alam. 1970. **Rice Tungro Virus in Native Populations of *Nephotettix Impicticeps* in East Pakistan.** *Int. Rice Comm. Newsletter.* 19 : (1) : 18-23.

Adult rice green leaf-hoppers were collected from six locations in the 1968 Aman season in East Pakistan. The locations included five rice fields and a light trap at a private residence. Insects from all six sites were found to be infected with tungro virus, with infection ranging from 8 to 46 %. The average infection rate was 21 % (473 infected plants of a total of 2,276 plants inoculated). One insect was used per plant. Light trap collections showed peak flights of *N. impicticeps* on October 10 and November 16.

Agr. : 517 Towheed, S. M. and S. M. H. Kabir. 1970. **Effects of Co Gamma Radiation on the Egg and Larval Stages of the Rice Weevil, *Sitophilus Oryzae* (L.).** *Nucleus.* 7: (1-2) : 59-64.

Eggs and larvae of the rice weevil, *Sitophilus oryzae* (L.) were exposed to various levels of gamma radiation from a Co⁶⁰ source. Maize grain, with approximately 14% moisture content, was used as the medium. The dose rate of the source was 24000 r/hr. at the time of radiation. The larvae were found to be more tolerant than the eggs. The eggs and larvae, respectively, failed to emerge as adults at 1000 and 5000 r.

Agr. 518, Alam, M. Z., A. Ahmed, S. A. Choudhury and M. A. Mannan, 1971. **Field Trials with Nineteen Foliar Insecticides for the Control of Rice Borers at Joydebpur Farm.** *Annu. Rep. Div. Entomol.*

FLA trial with nineteen foliar insecticides viz., Azodrin, Ambithion, Bayrosil, Chidial, Diazinon, Elsan, Furadan, Gar-dona Malathion, Gusathion, Nuvacron, Nexagon, Petkolin, Polwadofos, Phos-vel, Padan, Thiodan, linden and Zol-one was conducted at the rate of 0.75 lbs. active materials per acre for the control of rice borers on 1R-8 grown as Aus in 1970 at the Central AgriCul-tural Research Station, Joydebpur. The first application was given 30 days after trasplantation and the subsequent two treatments were applied at an interval of 15 days. The results were recorded and analysed after harvesting the crop. The percentage of infestation in the treated plots showed minimum infestation ranging from 2.00 to 3.00%, whereas control plot show 6.73 per cent infestation. Diazinon proved best regarding per cent increase in yield followed by Phosvel, Zolone, Padan, Thiodan, Gusathion, Bay-rosil, Azodrin and Elsan. Ogler showed inferior results.

Agr. 519, Alam, M. Z., A. Ahmed, S. A. Choudhury and M. A. Mannan. 1971. **Testing of Eighteen Granular Insecticides for the Control of Rice Borers at Joydebpur Farm.** *Annu. Rep. Div. Entomol.*

Dnring 1970 Aus crop a field trial was conducted with granular insecticides, viz., Azodrin, Disyston, Diazinon, Ekalux, Gardona, Lannate, Lebaycid, Nir-an, Neosar, Nuvacron, Phosvel, Sapecron, Solvigam, Sevidol, Thimet, Thimet rBHC, Thiodan and Unden at the rate of 1.5 lbs. active material per acre for the control of rice borers at the Central Agricultural Research Station, Joydeb-pur. The first treatment of insecticides was applied 30 days after transplantation and the next treatment was applied at an interval of 22 days. After harvest the results were recodred and analysed. The treated plots showed a miuimum infestation ranging from 1.20 to 2. 15 per cent. In control plot the infestation was 6.95 per cent. Regarding increase in yield, Thimet, Diazinon, Phosvel, Disyston, Sol-vigam, Azodrin, Ekalux, Sevidol, Lc: bay-cid and Nuvacron showed better results.

Agr. 520, Alam, M. Z. 1971. **Evaluation of Some Granular Insecticides for the Control of Rice Borers And Hoppers in East Pakistan.** *Proc. CENTO Panel Meeting on Pesticides, Karachi.*

The field experiments conducted with different granular insecticides in East Pakistan have been reviewed. The effect of the granules on different pests with their different dosage rates has been indicated. The methods and duration of application of various granules have been enumerated. Advantages of grannlar insecticides over conventional foliar applications have been discussed.

Agr. 521, Alam, M. Z., M. S. Alam and M. Abbas. 1971. **A Comparative Study of some Granular and Foliar Insecticides for the Control of Rice Borers, Leaf and Plant Hoppers in East Pakistan.** *Pakistan J. Sci. hid. Res. Karachi.*

Two sets of experiments were conducted at Joydebpur, Dacca to compare the effects of Azodrin, Diazinon, Ekalux, Gardona, Lebaycid, Nuvacron, Phosvel, Thiodan, and Unden both in the form of granular and foliar on rice crop for the control of borers, leaf and plant hoppers and to observe the incidence of Tungro virus and the yield of grains. The granular and foliar insecticides were applied at the rate of 1.75 lbs. and 14 oz. (active ingredient) per acre respectively. From the results it appears that granular insecticides have shown better efficacy for the control of rice borers but the foliar insecticides gave the better control of hoppers and thereby decrease of the incidence of virus disease than the granular insecticides. More increases in yield have been recorded with granular insecticides in comparison to other corresponding foliar insecticides over the control plots.

Agr. 522, Alam, M. Z. 1971. **Recent Progress in Rice Insect Research in Pakistan.** *Proc. Symp. Rice. Insects. Trop. Agr. Res. Centre, Tokyo, Japan.*

Importance of the rice insects have been discussed. Seventeen different important insect pests have been enlisted. Feeding habits, nature and extent of injury of each pest have been enumerated. Life history of each insect has been described. Seasonal cycles and natural enemies have been discussed. Control measures on the basis of the field trials have been recommended.

Agr. 523, Alam, M. Z. 1971. **Insect Vectors of Virus Disease of Rice.** *Action, 9 (1), Lahore.*

Insect pests are the causes of low yield of rice in East Pakistan. 24 different species of hoppers covering 9 families so far recorded on rice fields in East Pakistan are enlisted. The green leaf hopper, *Nephotettix incipiticeps* (Ishihara) carried the Tungro virus and Yellow dwarf diseases. The brown -plant hopper, *Nilaparvata lugens* (5) transmits the Grassy stunt virus disease and the zigzag hopper, *Recilia dorsalis* (mots.) transmits Orange leaf virus disease. Symptoms of each disease has been briefly described. Nature of damage caused by each of the major hoppers has been enumerated. Preventive measures on the basis of field trials by insecticides have been recommended.

Agr. 524, Alam, M. Z., M. S. Alam and M. Abbas. 1971. **Evaluation of Some Granular Insecticides for the Control of Rice Borers and Hoppers in East Pakistan.** *Proc. 23rd Pakistan Sci. J. Peshawar.*

Field experiments were conducted with eighteen granular insecticides on IRS-288-3 rice

grown as Boro during 1962-70 to compare their effectiveness in minimizing the infestation of borers, hoppers and incidence of Tungro virus and the increase in yield of grain. The granular insecticides were Azodrin, Dia-zinon, Disyston Ekalux, Gardona, Lan-nate, Lebaycid, Nuvacron, Niran, Neosar, Phosvel, Sevidol, Solvigam, Sapecron, Thimet, Paddigard, Thiodan and Unden. They were used at the rate of 1.75 lbs. active ingredients per acre. The first treatment was applied 25 days after transplantation and two other subsequent applications were given at 30 days upto primordial stage. Control plots were left untreated. Effect of the granules on borers and leaf hoppers and incidence of Tungro virus were recorded. The per cent increase in yield over control plots were recorded as 57.08, 63.70, 77.51 47.94, 47.50, 43.09, 55.05, 53.02, 46.22, 41.45, 55.05, 57.08, 88.34, 76.51, 82.60, 84.85, 45.69 and 46.22 for the above named insecticides respectively. The cost -benefit ratios were also shown.

Agr. 525, Alam, M. Z., M. S. Alam and M. Abbas. 1971. **Status of Different Borers as Pests of Rice in East Pakistan.** *Proc. 23rd Pakistan Sci. Conf. Peshawar.*

The status of different species of stem borers on different rice crops in East Pakistan has been enumerated. According to their intensity of infestation they are *Tryporyzae incertulas* (Walker), *Chilo traea polychrysa* (Meyrick), *Sesamia inferens* Walker, their occurrence on three different crops Aus, Aman and Boro have also been discussed.

Agr. 526, Alam, M. Z., M. S. Alam and M. Abbas. 1971. **Effectiveness of Some Foliar insecticides for the Control of Rice Borers and Hoppers an East Pakistan.,** *Proc. 23rd Pakistan Sci. Conf. Peshawar.*

Field experiments were conducted in a randomised block design with three replications at the Central Agricultural Research Station, Joydebpur during Boro season of 1969-70 on IR-8 with 1a foliar insecticides to find out their effect in minimising the borer infestation, leaf hopper population and incidence of Tungro virus and also on the yield of grains. Eighteen foliar insecticides, Azodrin, Ambithion, Bayrosil, Cidial, Diazinon, Elsan, Gusathion, Gardona + Malathion, Nexagen, Nuvacron, Padan, Folwade fos, Petkolin, Phosvel, Supracid, Thiodan, Unden and Zolone were used at the rate of 14 ounce active ingredient per acre. Six applications were required at 15 days interval from 25 days after transplantation up to prim- ordial stage.

Agr. 527 Choudhury, J. C. S. and S. M. H. Kabir. 1971. **Insecticidal Tests for the Control of Rice Hoppers and Rice Stem Borers.** *M. Sc. (Ag.) Thesis. East Pakistan Agr. Univ. (MS). 107 p.*

Twelve rice hopper species were identified on the basis of morphological characters under two separate families, Cicadellidae and Delphacidae. Among the 12 species only 4 species, *S. fur-cifera*, *N. lugeus*, *N. apicalis* and *N. impicticeps* were found destructive and economically important. Almost all the species of rice hoppers identified were available in every cropping

season but their relative abundance varied greatly. Basudin at higher dosage exhibited most promising results in both Aus and Aman season. Sevidol at 3.0 lbs./acre was also satisfactory. No significant relationship was observed between the infestation. No significant relationship was observed between the infestation of the pests and grain yield.

Agr. 528, Kabir, S. M. H. and M. Daud Mia. 1971. **Residual Toxicity of Three Organophosphorus Insecticides Applied to Control the Rice Hispa, *Armigera Oliv.*** *Indian J. Agr. Sci.* 41: (1) : 25-29.

Three organophosphorus insecticides- azodrin, bidrin and diinecron applied on the foliage of rice (*Oryza saliva* L.) under green house conditions gave excellent control of the rice hispa (*armigera* Oliv.) upto 7 days with concentrations between 0.10 and 0.05% solution. The insecticides showed similar residual persistence and apparently lost potency from the 10th day after the treatment. The residual effectiveness of the lower dosages decreased more rapidly with the time interval after the application of the toxicants.

Agr. 529, Huq, S. B. and N. I. Bhaiyan. 1971. **Efficacy of Certain Granular Insecticides in Controlling Some Major Rice Insect Pests.** *Proc. 23rd All Pakistan Sci. Conf.* 49 p.

Two species of rice stemborers, namely *Tryporyza incertulas* Walker and *Chilo tratraea polychrysa* Meyrick attack almost all rice varieties in East Pakistan. Three varieties, Katakara (Dacca-2), Latishail (Dacca-17) and IR6-156-3-3 were tested to study their comparative susceptibility to the rice stemborers under local conditions. IR6-156-3-3 was found to be more susceptible to the stemborers than the local varieties in both Aus and Aman seasons. Attempts were made to control rice stemborer by the application of certain granular insecticides at an interval of 20 days starting from 10 days after transplantation under controlled irrigation. Higher dosages were applied twice against three applications of lower dosages. All dosages of Sevidol (1.5 kg/ha, 2.0 kg/ha., and 3.0 kg/ha., Diazinon (2.0 kg/ha., 2.5 kg/ha., and 3.0 kg/ha.) and Ekalux (2.5 kg/ha.a.i.) almost equally controlled rice stemborers. Bidrin was not found to be effective. As regards leaf-hoppers, infestation was high in Aus season. Sevidol and Diazinon were found to be better in controlling leaf-hoppers, thus checking the virus infestation in Aus season.

Agr. 530, Alam, M. Z., A. Ahmed, S. A. Choudhury and M. A. Mannan. 1972. **Testing of Foliar Insecticides for the Control of Rice Borer at Joydebpur.** *Annu. Rep. Div. Entomol.*

An experiment was conducted with ten foliar insecticides, viz., Fundal, Uden, Ambithion, Fac, Salithion, Surecide, Bir-lane, Imidan, Diazinon, Ekalux with a dose of 12 oz. active material per acre, for the control of rice borer on IR-20 grown as Aman in 1971 at the Central Agricultural Research Station, Joydebpur.

The first treatment was applied 30 days after transplantation and subsequent two further

treatments were applied at an interval of 15 days. After harvest, results were analysed and recorded. All the treated plots showed minimum infestation varying from 2.5 to 2.95 per cent but average yield showed maximum in the plots treated with Ekalux, Diazinon, Fundal and Birlane. Next promising results were exhibited in the plots treated with Imidan, Unden, and Ambithion and others showed inferior results.

Agr. 531, Alam, M. Z., A. Ahmed, S. A. Choudhury and M. A. Mannan. 1972. **Control of Rice Borer with foliar Insecticides at Joydebpur Farm.** *Annu. Rep. Div. Entomol.*

A field trial was conducted with ten foliar insecticides, viz., Fundal, Fac, Birlane, Imidan, Diazinon, Ekalux, Sum-ithion, Bidrin and Dimecron at the rate of 12 oz. active material per acre for the control of rice borer on IR-8 grown as boro in 1972 at the Central Agricultural Research Station, Joydebpur. The first treatment was applied 30 days after transplanting and subsequent two treatments were applied at an interval 15 days. The results were analysed and recorded after harvest. The treated plots showed minimum infestation varying from 2.05 to 2.79 per cent, maximum average yield was achieved in the plots treated with Diazinon. Next promising results were obtained with Ekalux, Imidan and Unden. The remaining others showed inferior results.

Agr. 532, Alam, M. Z., A. Ahmed, S. A. Choudhury and M. A. Mannan. 1972. **Field Trials with Eleven Granular Insecticides for the Control of Rice Borers at Joydebpur Farm.** *Annu. Rep. Div. Entomol.*

Field trial was conducted with eleven granular insecticides, viz., Fundal, Paddi-gard, Lebaycid, Galecron, Unden, Imidan, Diazinon, Furadan, Fac Padan and Terracur-P at the rate of 1.5 lbs. active material per acre for the control of rice borers on IR-20 grown as Aman in 1971 at the Central Agricultural Research Station, Joydebpur. The first treatment was applied 30 days after transplanting and the second or the last treatment was applied 22 days after the first treatment. After harvest the results were analysed and recorded. The treated plots showed minimum infestation ranging from 2.55 to 3 per cent whereas control plot showed 7.73 per cent infestation. As regards yield, Diazinon proved best and next to this Imidan, Furadan and Padan gave the promising results.

Agr. 533, Alam, M. Z., A. Ahmed, S. A. Choudhury and M. A. Mannan. 1972. **A Comparative Study of Some Granular Insecticides for the Control of Rice Borers on IR-8 at Joydebpur farm.** *Annu. Rep. Div. Entomol.*

A field trial was conducted to compare the effectiveness of eleven granular insecticides, viz., Fundal, Paddigard, Lebaycid, Galecron, Unden, Imidan, Diazinon, Furadan, Fac, Padan and Terracur-P at the rate of 1.5 lbs. active material per acre against rice borers on IR-8 grown as boro in 1972 at the Central Agricultural Research Station, Joydebpur. The first application was given 30 days after transplanting and subsequent application was given 22 days after the first treatment. After harvest the results were analysed and recorded. The

treated plots showed minimum infestation ranging from 2.12 to 3.01 per cent. Maximum average yield was obtained with Diazinon. Next promising results were given by Paddan, Imidan, Lebaycid and Paddigard respectively. The remaining others showed inferior results.

Agr. 534 Alam, M. Z., M. S. Main and M. Abbas. 1972. **Status of Different Stem Borers as Pests of Rice in Bangladesh.** *Int. Rice Comm. Newsletter*. 21 (2).

The status of different species of stem borers on different rice crops grown in Bangladesh has been enumerated. According to their intensity of infestation they are *Tryporyzas incertulas* (Walker), *Chilo traea polychrysa* (Meyrick), *Sesamia inferens* Walker and *Chilo traea auricilia* (Dudgeon). The number of generations and their occurrences on three different crops, aus, aman, and boro have also been discussed.

Agr. 535, Shah jal'-ln. M. 1972. **Potential Use of Mutation Breeding for the Control of Rice Stem Borers.** *Nucl. Appl.* 6 (A) : 64-65.

A recent estimat show about 2.8 damage of rice by stem borers in Bangladesh. The chemical attack have very little appreciable results. Therefore, a proposal, with a support from the preliminary results, has been made to use mutation breeding for the development of stem borer resistant rice varieties. This method seems to be very effctive for the control of rice stem borers because of their host-plant specificity and internal feeding habit.

Agr. 536, Alam, M. Z and M. S. Alam. 1973. **Morphoogical Characters of Rice Hoppers and Their Role in Transmitting Virus Diseases in Bangladesh.** *Bangladesh J. Zool.* 1 (1).

Rice hoppers cause considerable injury to rice plants by sucking internal sap. Out of eight species, four are responsible for transmitting virus diseases. A list of all eight spcies, recorded in Bangladesh, is given and their brief morphological characters are described, symptoms of virus diseases transmitted by hoppers have also been briefly enumerated.

Agr. 537 Alam, M. Z. 1973. **Vertebrate Pests in Bangladesh.** *Proc. FAO Adhoc panel on Vertebrate pest Control and Rice Gall Midge Seminar, Bangkok.*

Five species of rats and two species of mouse have been listed and their types of injury on different field crops and stored grains have been briefly described. Other vertebrate pests (Mammals & birds) have been indicated. A brief account on the control of rats has been given.

Agr. 538 Alam, M. Z. 1973. **Rice Gall Midge As a Pest in Bangladesh.** *Proc. FAO Adhoc panel on Vertebrate pest control and Rice Gall Midge Seminar, Bangkok.*

Results on the studies on rice gall midge presented as country report. Occurrence of the pest has been indicated. Distribution has been given and nature and extent of damage in

Bangladesh have been indicated. Brief description of different stages have been given. General control practices used in Bangladesh have been enumerated.

Nutrition

Agr. 539 Habibullah, A. K. M. and A B. Khan. **1964. Soil and Fertilizer Phosphorus Uptake by Rice Plants From Different Soils of East Pakistan.** *Pakistan J. Soil Sci. 1 (1) : 57-62.*

A pot experiment with P^{32} labelled superphosphate 0, 40, 80 and 160 lbs. P_2O_5 /acre was conducted on five East Pakistan soils representing old lateritic soils and young flood plain soils, using Aus paddy (Autumn rice) as test crop. Maximum yield response due to phosphatic fertilizer application was recorded in Dacca (Madhupur Tract) and Bogra (Barind Tract) soils in all treatments in comparison to soils of Khulna (Saline Tract), Bonarpara (Tista Silt) and Chand-pur (Meghna Alluvium). Only the treatments of 40 and 80 lbs. P_2O_5 / acre of Bonarpara soil responded more or less equally with Bogra soils. Khulna soils did not show much response. Alluvial soils of Khulna, Chaudpur and Bonar-para showed insignificant response to the application of phosphorus fertilizer. The result indicate that phosphorus fertilizer is more effective in acid soils of Dacca where availability of soil phosphorus is low. Paddy grown on acid soils gave values of percentage utilisation of added P_2O_5 ranging from 4.3 to 9.7 while the values obtained from alluvial soils were between 1.8 and 5.5.

Agr. 540, Karim A. and M. Idris. 1964. **Studies on The Effect of Npk Balance of Soil on the Growth and Yield of Rice Plants.** *Pakistan J. Soil Sci. 2 : 1-8.*

A study of the effect of high level fertilization at different relative $N:P_2O_5:K_2O$ ratios of soil on the growth and yield of rice plants was **made**. The quality of the harvested paddy was also studied. The variety of rice employed in the investigation tolerated, very well indeed, a very high fertility level unexplored heretofore, the level being nitrogen 197 pounds per acre, P_2O_5 590 pounds per acre and K_2O 590 pound per acre. The balancing of NPK of soil to stipulated ratios brought about a notable favourable change in general growth conditions, the tillering and earing of the plants. The harvesting period was also hastened by four week. The soil $N:P_2O_5:K_2O$ ratio of 1:2:2 has been found to be optimal in consideration of the yield and also of the quality of the produce. The yield, at this ratio, went up to six times that under the control.

Agr. 541, Karim, A. Q. M. B and M. Mohsin. 1964. **Iron-Manganese Relationship in the Nutrition of Rice.** *Pakistan J. Soil Sci. 1 (1) : 69-79.*

Soil sample representing 0 to 6 inches depth was collected from the suburb of Dacca city and processed in the laboratory. The processed soil was first fertilized with NPK fertilizers. It was further found that when Fe and Mn were applied together at different levels, they were also found to increase the growth of plants in respect of dry matter, grain-yield, carbohydrate and protein contents. But such increases in growth under the combined

effect of Fe and Mn were considerably less than those obtained under the treatment receiving iron alone. This indicated that the presence of Mn pulled down the good effect of Fe on the growth of rice plants when it was applied along with the latter.

Agr. 542 Gaffar, M. A. 1965. **Study into the Effect of Different Levels of Nitrogen and Plant Population on the Yield of Dha-Rial Aus Paddy.** *M. Sc. (Ag.) Thesis. East Pakistan Agr. Univ. (MS). 110 p.*

An experiment was conducted during 1964 at the East Pakistan Agricultural Institute Farm, Dacca to study the effects of 4 levels of nitrogen and 4 plant spacings on the Dharial aus rice. With increasing nitrogen application the grain and straw yield increased. Closer the spacing, the higher was the grain and straw yields. The height of the plant and length of the panicle increased significantly with wide spacing and higher level of nitrogen application. 4 inches plant spacing and 48 lbs. nitrogen/acre was found most profitable in the economic point of view.

Agr. 543 Hossain, M, M. 1965. **Effect of Different Combinations of NPK on The Performance of Three Varieties of Aman Paddy With Special Reference To The Importance of Potash.** *M. Sc. (Ag.) Thesis. East Pakistan Agr. Univ. (MS). 54 p.*

A field experiment was carried out in the East Pakistan Agricultural University Farm, Mymensingh to find out the responsive variety of rice with 2 levels of N, two levels of P_2O_5 , and 5 levels of K_2O . It was found that variety Naizersail out yielded significantly the varieties Lalbiroi and Kassyabinni.

The fertilizer level 40-35-66 was found to have the best result. But the high level of potash with high level of nitrogen and phosphorus produced unfavourable results. The varieties Lalbiroi and Kassyabinni logged irrespective of the doses of potash applied.

Agr. 544, Eaqub, M. and Khan. D. H. 1966. **Growth, Yield And Chemical Composition of Rice Plant (Transplant Aman, Variety Nigershail) Under Different Soil Fertility Conditions.** *M. Sc. (Ag.) Thesis. East Pakistan Agr. Univ. (MS). 223 p.*

A fertilizer trial was laid out in the field of East Pakistan Agricultural University Farm land (Brahmaputra alluvium) using four rates of N, P, and K fertilizers upto a maximum level of 120 lbs. per acre. There were 64 treatment combinations which was replicated 4 times giving a total of 526 plots. The N and P application increased the yield of rice straw and grain. While K decreased the yield slightly. It is, however, observed that the treatment $N_{30}P_{120}K_{40}$ brought about the best yield in relation to yield (about 60 mds./acre) and economics of fertilizer use. The nutrient elements like N, P, K, Ca, Mg, Na, S, Cl, and Si were analysed in the rice straw and grain.

Agr. 545, Harunullah, M. 1966. **A Study on the Effect of Different Levels of Nitrogen Applied at Different Stages of Plant Growth on Three Different Varieties of aus Paddy Grown Under Transplant Condition.** *M. Sc. (Ag.) Thesis. East Pakistan Agr. Univ. (MS).* 92 p.

A field study with Aus paddy was made in the medium low land of East Pakistan Agricultural Institute Farm, Dacca, with 3 varieties and 3 levels of nitrogen in 1965. The variety Pankhiraj produced taller plants, longer panicles, heavier grain, more amount of straw than those of Dharial and Kataktara varieties. The yield was highly significant with 45 lbs. of Nacre. The varieties had similar response to levels of nitrogen and its split application.

Agr. 546, Islam, A. and S. Rahman. 1966. **The Effect of Associated Salts on the Availability of Soil Phosphorus and its Uptake By Rice Plants.** *Pakistan J. Biol. Agr. Sci.* 9 (2) : 11-16.

The application of $(\text{NH}_4)_2\text{SO}_4$, CaSO_4 , MgSO_4 increased the availability of phosphorus in soils and also increased the uptake of phosphorus by rice plants. The introduction of FeSO_4 and $\text{Al}_2(\text{SO}_4)_3$ decreased the availability of phosphorus and also decreased the uptake of phosphorus by rice plants. The addition of K_2SO_4 though decreased the availability of phosphorus in soils under water logged of increased doses of nitrogen fertilizer condition, but increased the uptake of phosphorus by rice plants.

Agr. 547, Choudhury, R. and A. A. A. Muhsi. 1967. **The Analysis of Various Levels Of Nitrogen in Rice Plants, Due to the Incorporation of Various Doses of Mixed Fertilizers in the Field to Establish its Relation to High Yield.** *M. Sc. (Ag.) Thesis. East Pakistan Agr. Univ. (MS).* 83 p.

Variation in total intake of nitrogen by Latisail (V_1) and 1R8-288-3 (V_2) and the periodicity of that intake of two varieties associated with different morphological changes and total yield were studied under condition of different fertilizer treatments. The results obtained from the study indicated that the heights of the two varieties gradually increased as the fertilizer doses were increased from zero treatment (T_0) to 80 lbs. of nitrogen per acre. The variety V_1 in all cases showed more elongation than V_2 . Number of tillers increased as the concentration of applied fertilizer was increased to a certain limit after which further increase in fertilizer decreased tillering. The formation of effective tiller also followed the same trend but the decrease in effective tillers was caused by even a smaller dose of fertilizer than that was needed to reduce vegetative tiller formation. The size of leaf followed the same course as the height. Application delayed flowering. V_2 produced early flowering than V_1 . A direct correlation was observed

between nitrogen application and nitrogen uptake in a vegetative tissue of rice plants studied. Nitrate nitrogen in both varieties and at all stages of growth remained the same and was 0.01 % of the dry weight of the tissue materials. The grain yield of both the varieties increased with the increase in nitrogen fertilizers, but in all treatments V₁ produced more grain than V₂.

Agr. 548, Ali, S. M. E. and A. Karim. **1967. Studies on the Effects of Nitrogen in Presence and Absence of Phosphorus and Potassium on the Quality of Rice Plants and Grains.** *M. Sc. (Ag.) Thesis. East Pakistan Agr. Univ. (MS)*. 211 p.

A field study on the qualitative performance of two high yielding varieties, IR-8-288-3 and IR-9-60, as compared with Naizershail, a local standard variety, was conducted on the Brahmaputra Alluvial soil Tract in the Rabi season of 1960. The criteria used for qualitative performance were the measurements of protein, starch, and fat contents of straw and grains and also calcium, magnesium, potassium and phosphorus contents of grains only. Though the local variety did better than the exotics at low fertility levels, the HYV's excelled the native one at high fertility managements. Application of nitrogenous fertilizer increased the protein content most significantly in addition to increasing minerals like calcium, magnesium, potassium and phosphorus for grains, It depressed the starch content while favoured fat accumulation at lower doses. Potassium and phosphatic fertilizers, applied together, increased starch, fat, calcium, potassium and phosphorus but decreased protein and magnesium contents. This trend of effects due to NPK-fertilization was the same in both straw and grain of the varieties studied and the protein-starch correlation was very significantly negative in all cases. It was concluded that by applying judicious amounts of suitably combined fertilizer elements, the quality of rice crop may be moulded in desirable direction.

Agr. 549, Islam, A., M. Ahmed and M. Jahangeer. 1967. **The Phosphate Potential and Phosphate Concentration in Some acid Soils of East Pakistan in Relation to the Uptake of Phosphate by aus Paddy.** *Pakistan J. Soil Sci.* 3 (2): 24-29.

Phosphorus application alone or with lime increased the uptake of phosphorus by rice plants growing on all the soils. Liming also resulted in increased uptake. Significant correlations were obtained between phosphate potential and phosphate uptake by rice plants growing on all soils. No significant correlations were obtained between chemically extractable phosphorus and phosphorus uptake except in two cases. Therefore, it was concluded that phosphorus uptake by aus paddy growing on the acid soils was governed by phosphate potentials of the soils and not by concentration of the phosphorus extracted by chemical extractants. The availability of phosphate in acid soils may be better estimated from phosphate potential of the soils.

Agr. 550, Karim, A, M. Y. Chowdhury and T. Islam 1967. **A Study on the Effects of Npk Fertilisers on the Quality of Rice Grains.** *Sci. Res.* 4 (4): 198-206.

Effect of NPK fertilizers applied in the form of Urea, T.S.P. and Muriate of Potash respectively on the quality of transplant aman rice (Naizershail) has been studied. The supply of N-fertilizers increased the protein and fat contents steadily, but P and K fertilizer's independently depressed the contents. N and P fertilizers independently decreased the starch contents, while the K was variable but had depressing effect.

Agr. 551 Karim, A.Q.M.B. and S.M. Alam. 1967. **Use of Radio isotopes in the study of the interaction between Fe and Mn and their effects on the uptake of Phosphorus by Rice Plants.** *Pakistan J. Soil Sci.* 3 (1): 44-51.

It was therefore concluded that in the nutrition of rice plants Fe and Mn were antagonistic to each other when they were applied together to the culture medium. On account of their antagonistic reaction any of them when applied together to the culture medium, tended to reduce the uptake of the other by rice plants. When Fe and Mn applied together to the culture medium containing different levels of p^{32} , no definite result was obtained with regard to the absorption of p^{32} by rice plants.

Agr. 552 Uddin, M.G. 1967. **A study on the effect of the application of nitrogen and irrigation at different stages of transplant aman paddy.** *M. Sc. (Ag.) Thesis. East Pakistan Agr. Univ. (MS).* 105 p.

A field trial was conducted in the agronomy division of the East Pakistan Agricultural Research Institute, Dacca with Nizershail, a transplant aman paddy to see the effect of nitrogen and irrigation on yield and yield components. The best combination was 2" inches standing water from post-effective first to post-effective tillering and a second at panicle initiation stage. Increase in grain was supported by the increase in the number of ear-bearing tillers/plant, fertile spikelets/panicle and grain weight. The highest yield of 6523 lbs./acre of dry paddy was obtained by the best treatments combination as against 1605 lbs./acre, due to control of both irrigation and nitrogen, the yield increased about 400%.

Agr. 553 Khair, A.B.M.A. 1968. **Effect of the application of nitrogen at different stages of plant life and different levels of phosphate on the yield of IR-8.** *M. Sc. (Ag.) Thesis. East Pakistan Agr. Univ. (MS).* 126 p.

A field trial was made at Dacca farm under the Agronomy Division of Bangladesh Agril, Research Institute in 1967 to study the effect of different levels of phosphate and time of application of nitrogen on the yield and yield contributing characters of IR-8-288-3. The IR8-288-3 is best if cultivated in aman season, with 100 lbs. of N/acre, in two splits, appears to give more encouraging yield, provided 60 lbs. P_2O_5 and 1bs. K_2O /acre also applied at the final puddling.

Agr. 554 Ahmed, I. U., S. Rahman and M. Rahman, 1968. **Effect of sulphur on the uptake of phosphorus by rice plant from soil fertilized with rock phosphate.** *Pakistan J. Soil Sci.* 5 (1) : 1-40.

A study was made in the green-house to determine the effect of elemental sulphur on the availability of phosphorus from rock phosphate added in soil under field moisture and water logged conditions, and to determine its effect on the yield and growth of rice. From the results mentioned above it may be concluded that the effect of elemental sulfur on the availability of phosphorus from rock phosphate is promising at field moisture condition. But under water-logged condition the effect of sulphur was not marked although sufficient phosphorus had been taken up by the plants.

Agr. 555 Ahmed, I.U. and M. Molla. 1968. **Mineralization of slaughter house blood in soil at submerged and field moisture conditions in relation to the growth and yield of rice.** Proc. 20th Pakistan Sci. Conf. Abs. Sec. Agr. A-72.

Addition of dried blood in soil increased the yield of grains and dry matter content of rice plants grown in pots both at submerged and field moisture condition over the control. The yields (grain and dry matter) were always greater at submerged condition than the field moisture condition. At submerged condition, the yields of grains were increased by 266, 519, 436 and 265% over the control for the addition of dried blood at the rates of 1, 2, 4 and 8 tons/ac. respectively. The nitrogen and phosphorus contents in plants were increased by 133 and 96% due to addition of blood over the control. No appreciable increase in potassium, however, was observed. The release of ammoniacal nitrogen in soil was directly proportional to the amount of blood added in soil and to the days of incubation. Submerged condition was more favourable than the field moisture condition. Accumulation of nitrate nitrogen was also increased with higher application of blood but more nitrate was accumulated at field moisture treatments than at submerged condition.

Agar. 556 Alim, A., A. Ahmed and L. Rahman, 1968. **Responsiveness of IRRI varieties of rice fertilizer against local improved varieties.** Proc. 20th Pakistan Sci. Conf. Abs. Sec. Agr. A-34.

A fertilizer-cum-varietal trial was conducted at Savar, Comilla and Habiganj Rice Research Stations during the Aus and Aman seasons of 1966-67 to study the responsiveness of two IRRI varieties, IR8 and IR9 to different levels of fertilizers against the local improved varieties of the respective season since very little response of potash beyond 40 lbs. per acre was seen in East Pakistan, it was decided to keep K_2O fixed at 40 lbs. per acre in the NPK combinations. The doses of N and P_2O_5 and K_2O were each at 40, 80 and 120 lbs per acre along with a control, i.e. $N_0P_0K_0$ making a total of 10 treatments. The fertilizer-combinations were taken as the main treatments and the varieties as sub-treatments and these were grown in split-plot design with three replications. From the results obtained it was seen that with the application of increased doses of N and P_2O_5 the rate of increase in yield was

more pronounced in the case of IRRI varieties, that is, IRRI varieties were found to be more responsive to increased doses of N and P_2O_5 . The optimum levels of N and P_2O_5 were found to be at 80 lbs., each per acre.

Agr. 557 Khan, D. H. and M. Eaquad, 1968. **Removal of nutrients by trans. Plant Autumn rice grown in a subtropical soil of East Pakistan.** *Int. Rice. Comm. Newsletter*. 17(3): 40-44.

A partially confounding factorial experiment was carried out in the Brahmaputra alluvial soil of Agricultural University farm at Mymensingh in 1965. The results showed that the straw of rice plant (Nigershail) removed appreciable amount of potash from control plot which was about three times more than nitrogen removal and seven times more than phosphate removal, whilst rice grain removed appreciable more nitrogen than phosphate and potash. It further appears that the nutrient removal by a crop (straw and grain) of 89.91 lbs. amounted to 78.48 lbs. N, 35.47 lbs. P_2O_5 114.25 lbs. K_2O , 20.46 lbs. Ca, 10.92 lbs. Mg, and 8.04 lbs. S per acre, Data on the recovery of added N, P, and K fertilizers show greater N recovery by rice straw and grain as compared to P and K recoveries.

Agr. 558 Quddus, M.A. 1968. **A study on the correlation of soil test phosphorus with the crop yield and total uptake of phosphorus response by rice.** *Pakistan J. Soil Sci.* 4 (1) : 37-43.

A green house experiment was conducted using three Coast Prairie rice soils Hockley fine sandy loam, Beaumont clay and Lake Charles clay fertilized with different levels of phosphorus to study the relationship of yield response and total uptake of phosphorus response by rice with soil test phosphorus which was extracted by three chemical methods. NH_4Ac , NH_4HCO_3 and $NaHCO_3$ in order to show superiority, if any, of one method over the other in this correlation study.

Agr. 559 Ahmed, I.U. and S.M.A. Faiz. 1969. **A study of the effect of different levels of nitrogen and water on the growth, yield and quality of ir-8-288-3 rice.** *Pakistan J. Soil Sci.* 5 (1): 1-40.

The height, number of tillers, yield of straw and grain per plant increased progressively with the increase in nitrogen per acre. Above 250 lbs. N/acre there was no considerable change. While the variation in water level did not affect the height, number of tillers and they yield of grain, there was an overall increase in straw yield due to increase in water level. The total number of grains per panicle increased with the application of up to 150 lbs. /acre. The variation in water level did not effect the total number of grains per panicle. The weight of 100 grains increased with the application of nitrogen and attained the maximum value at 1bs. /acre at all the water levels. Above 100 lbs. N/acre any more addition of nitrogen decreased the weight of 100 grains considerably. There was an overall increase in 100 grains weight due to increase in water level. The protein content of straw and grain increased progressively with the increase in nitrogen supply and there was an overall increase in the protein content of

straw and grain due to increase in water level. The starch content of rice straw and grain decreased with increasing N supply and protein content of the plant.

Agr. 560 Haque, M.F. and A.B. Khan. 1969. **Effect of Phosphorus and Potassium on the Growth, Yield and Chemical Composition of Rice Plant Grown In Boro Season.** *M.Sc. (Ag.) Thesis, East Pakistan Agr. Univ. (MS)*. 92 p.

The experiment was conducted in the Mirpur farm (Dacca) of the BADC with IR8-288-3 and Habiganj-8 in boro season of 1968. The result suggest that the application of P and K either singly or in combination may affect the growth of rice plant differently depending on growth of rice fertilization.

Agr. 561 Islam A. and G. Kibria. 1969. **Effect of physical and chemical treatments on the growth and yield of rice plants in a saline soil.** *Pakistan J. Biol. Agr. Sci.* 12 (1): 74-83.

Both physical and chemical treatments affected the growth significantly. Calcium carbonate produced the best vegetative growth as reflected from dry matter production and tiller number. The yield of grains were increased by the use of all amendments. CaO₃ at the rate of 0.5 ton per acre produced the best yield. The order of efficiency in increasing yield was calcium carbonate, calcium chloride, calcium hydroxide, iron sulphate, water leaching green manure, calcium sulphate, sulfuric acid blank, Nitrogen, boron, potassium and magnesium contents of rice plants were not statistically significant. While nitrogen contents showed an increasing trend with amendments, boron potassium and magnesium contents suggested no trend, phosphorus calcium and sodium contents were statistically significant at 1% level. While phosphorous and calcium contents increased with amendments, sodium contents decreased, significant positive correlations at 1% level were obtained between leaf calcium and phosphorus and dry matter production and yield significant negative correlation at 1% level was obtained between sodium concentrations in levels and growth and yield of rice. These studies indicated that the better growth and yield of rice obtained in this study was associated with higher assimilation of calcium and phosphorus where amendments were made and lower assimilation of sodium, induced by the amendments. Thus, for better growth and yield of rice soils of similar characters occurring in East Pakistan must be reclaimed. Calcium carbonate application would seem to be most effective of all the amendments tried.

Agr. 562 Karim, A. and M. S. Ali. 1969. **A study on cation-anion relationships in the nutrition of rice plants.** *Soil. Res.* 6 (4): 203-214.

The relationships in the uptake of the different cations and anions of both major and some minor elements have been studied in two stages of growth of rice plants i.e. tillering and flowering. The m.e. cations varied directly with %N. A synergistic effect has been observed between nitrogen and silicon and potassium and phosphorus whereas an antagonism has been observed between chlorine and phosphorus and phosphorus nitrogen. The rice in the uptake of the divalent ions was attended by a fall in that of the monovalent. The ratio R, of captions:

anions has been found to be inversely proportional to %Nitrogen to fit the quadratic equation $R=1.194451-0.123543 N + 0.002432N^2$ (R being the ratio and N being the % Nitrogen).

Agr. 563 Rahman, L. 1969. **Performance of Late Planted Transplant Aman Paddy at High Fertility Levels.** (MS. Departmental work) 1-14.

The experiment was conducted to evaluate the effectiveness of different levels of complete fertilizers at different times of planting on Nigershail, a transplant aman rice variety. The result shows that the planting of this variety later than third September is not acceptable for good yield. But, even at this time high yield is possible if at least a complete fertilizer dose of 80-12-40 lbs. Per acre of N, P and K is applied. Even higher ranges of fertilizers at later dates favorably influenced the yield components.

Agar. 564 Hague, M.Z. 1970. **The role of organic constituents as direct source of nutrients in rice** (*o. Sativa* var. Japonica) plant. *Ph. D. Thesis. Grad./ School Kyoto Univ. (MS)*.

Low molecular organic components such as amino acids and nucleic acid bases were isolated from rice soil. These organic components directly absorbed by rice plants, were demonstrated by using radioactive substances. The incorporation speed of C^{14} labelled amino acids (aspartic acid, glutamic acid, threonine and proline) and C^{14} labelled nucleic acid bases (adenine, guanine cytosine and uracil) were studied at different stages of rice plant, it was found that C^{14} aspartic acid and C^{14} adenine were incorporated very rapidly in the rice seedling while the C^{14} proline and C^{14} uracil (and also C^{14} cytosine) incorporated into the reproductive stage of rice plant more rapidly than other C^{14} labelled amino acids and nucleic acid bases. The effect of various organic components at the reproductive stage of rice plant were studied using sand culture. The combined treatment of uracil and proline gave 46% increased yield over $NH_4 Cl$, The same treatment of uracil + proline were found to initiate the number of flower and fruiting in tomato (*Lycopersicum esculentum*) green pepper (*Capsicum gressum*), and egg plant (*Solanum melongena*).

Agr. 565 Khan, D.H., M.J. Islam, M.S. Haque, and N. I. Bhuiyan. 1970. **Ripening and Yield Characteristics of Some Recommended IRRI and Native Rice Varieties under East Pakistan Conditions.** *Int. Rice Comm. Newsletter. 21 (1): 24-28.*

The adaptability of some recommended IRRI rice varieties was tested under different soil fertility and climatic conditions of East Pakistan, and comparisons were made with the performances of the recommended local rice varieties. It was observed that the ripening of the IRRI varieties was delayed in most of the cases. Considering the yield performances, it appeared that IR8-288-3 produced higher grain yield except in 1967 autumn trial where IR8-288-3 was planted a little late and suffered badly due to the reduced temperature and shorter day length at the heading time.

Agr. 566 Rahman, A.B.M.M. and D.H. Khan. 1970. **Effects of N,P, and K fertilizers on the ripening characteristics of and p absorption by, some selected IRRI and native rice plants under different soil fertility conditions.** *M.Sc. (Ag.) Thesis. East Pakistan Agr. Univ. (MS). 120.*

A fertilizer-cum-verietal trial in rice (IR5-47-2 and Nigershail) was carried out during 1969 Aman season in the field of Agricultural University Farm land at Mymensingh. The ripening characteristics, yield performance and phosphorus absorption by rice plants were studied.

Agr. 567 Muhammad, F. and D. H. Khan 1970. **Studies on the Effects of Urea Application on the Germination and Seedling Growth of Some Cereal Crops under Different Soil Conditions.** *M.Sc. (Ag.) Thesis. East Pakistan Agr. Univ. (MS). 118 p.*

The experiments were conducted in the field of Agriversity farm and in the pots with three soils, viz. Gangetic alluvium, Madhupur red soil and Brahmaputra alluvium and two crops, viz. rice (IR-20) and wheat (Penjamo-62). Five different doses of urea (0, 75, 150, 225 and 300 kg. N/ha.) were used. It was observed that the urea-N when applied in surface soil in contact with seeds produced adverse effect depending on the urea-N rate, condition of experiments and soils. The laboratory studies showed that a substantial amount of nitrogen volatilized away from the added urea in soil, ammonia gas occupying a share in the volatilized N-products. The injurious effects of urea seemed to be largely due to the contact of volatilized ammonia, produced at the seat of urea-hydrolysis, with germinating seeds and seedlings.

Agr. 568 Patwary, S.U. S. Ahmed, A.K.M. Habibullah and M. Karim. 1970. **Relative Efficiency of Superphosphate and Rock Phosphate in the Supply of Phosphorus to Rice Plants.** *21st and 22nd Pakistan Sci. Conf. Rajshahi. A-2.*

An attempt has been made to assess the relative efficiency of processed phosphatic fertilizer (superphosphate) and natural phosphate (Rock phosphate) for Bangladesh soils using tracer technique based on A Value concept of Fried and Dean. The experiment was conducted in the green house on seven different pH (4.5 to 7.9) using radio active superphosphate. Results have been obtained for both Aman and Boro seasons of 1967-68. It had been observed that for certain acid soils rock phosphate is more efficiently used by rice plants than superphosphate.

Agr. 569 Haque, M.Z., M. Kobayashi and Eiici Takahashi. 1971. **The Chromatographic Patterns Of Nucleic Acid Prepared From P³² Labelled Rice Plant At Different Stages.** *Soil Sci. Plant Nutr. 18 (2).*

The MAK column chromatographic pattern of nucleic acid prepared from p³² labelled rice plant at different stages were studied. The rapidly labelled RNA could not be well recognized when rice seedlings were either cultural overnight in presence of p³². The rapidly labelled RNA was well recognized when nucleic acid was extracted immediately after 1.5 hrs.

Infiltration of p^{32} . The chromatographic patterns at seedling stage of rice plant were distinctly different from reproductive stage plant and buddy ear.

Agr. 570 Haque, M.Z., M. Kobayashi, K. Fujii and E. Takahashi. 1971. **The Incorporation of Amino Acids and Nucleic Acid Bases into the Seedling, Reproductive Stage and Young Ear Portion of Rice Plants.** *Plant and Soil*. 34 (1).

The incorporation of C^{14} amino acids (aspartic acid, glutamic acid, threonine and proline) and C^{14} nucleic acid bases (adenine, guanine cytosine and uracil) in to the seedling, reproductive stage and young ear portion of rice plant was investigated. It was found that C^{14} aspartic acid was incorporated into the rice seedling more rapidly than C^{14} threonine or proline and C^{14} proline was more rapidly incorporated than C^{14} aspartic acid into reproductive stage plant and young ear portion. Similarly C^{14} adenine was incorporated into the rice seedling more rapidly than other C^{14} labelled bases. On the other hand C^{14} uracil was preferentially incorporated to C^{14} adenine or C^{14} guanine into the reproductive stage plant and young ear portion. It is suggested from the results obtained that proline is polymerized into polypeptide or protein in the rice plant more rapidly at the reproductive stage than at the seedling stage and that a higher proportion of pyrimidine bases might be involved into the metabolic process at the reproductive stage of rice plant.

Agr. 571 Karim, M., S. Rahman and M. Rahman. 1971. **Rb^{86} As a tracer for potassium i. uptake of Rb^{86} and k by rice plant in nutrient solution.** *Plant and Soil*. 35: 179.

The successful use of Rb^{86} as a tracer for potassium in rice nutrition studies is related to the relative uptake of these two nutrient elements and the estimation of potassium by Rb^{86} analysis. Results obtained under nutrient culture condition showed that the ratio of rubidium: potassium in the substrate was similar to that in the plant and the amount of potassium determined by conventional method was comparable to that of radio-chemical analysis of Rb^{86} .

Agr. 572 Khan, D.H., I. J. Siddiqui, M.S. Hoque and N. I. Bhuiyan. 1971. **Nitrogen Content of Some IRRI and Native Rice Varieties under East Pakistan Conditions.** *Int. Rice Comm. Newsletter*. 20 (1): 1-3.

The effects of fertilizer-N on the distribution of nitrogen in grain and straw of some recommended rice varieties from the IRRI and native selections were studied. It was observed that the fertilizer-N increased the nitrogen absorption by plant tissue-both in straw and grains of the native and IRRI rice varieties. The varietal differences in nitrogen absorption capacity of the native rice plants was quite comparable to the selected IRRI varieties under local soil and climatic conditions.

Agr. 573 Fakir, M.A. and A.Karim 1972. **A study on the growth and yield characteristics of recommended ir-9, ir-20 and nigershail (native variety) of rice as affected by different rates on n, p, and k fertilizers in aman season.** *M. Sc. (Ag.) Thesis. Bangladesh Agr. Univ. (MS). 92 p.*

A fertilizer-cum-varietal trial on rice was carried out in the field of Agricultural University, Mymensingh during 1970 Aman season using four rates of N, two rates of each P and K. The observation on the grain yield of rice showed that N-application progressively increased the yield up to 90 kg/N/ha level in both the varieties. P-supply did not show any beneficial effect on the grain yield, whereas K fertilization increased the yield of both varieties. The treatments $N_{90}P_{20}K_{20}$ and $N_{135}P_0K_{20}$ produced the highest yield in IR-20 and Nigershail respectively. The economics of fertilizer use did go in favour of IR-20 as Nigershail brought about better net economic return.

Agr. 574 Rahman, M.H. and M. Idris. 1972. **A Comparative Study of the Effects of Urea and Ammonium Sulphate on the Growth, Yield and Protein Content of Rice.** *M. Sc. (Ag.) Thesis Bangladesh Agr. Univ. (MS).*

The experiment was conducted in Bangladesh Agricultural University Farm soil with a variety of rice IR-9 and two nitrogenous fertilizers, urea and ammonium sulphate. The fertilizers were applied at the rates of 0, 80, 100, 120 and 140 lbs. of N per acre. The yield and protein content of rice increased with increasing rates of N application. Urea and ammonium sulphate were equally effective when tillering and grain yield were concerned but the former was superior to the latter when the straw yield, length of panicle, fertility of grains and the protein contents of both straw and grain were considered.

Agr. 575 Bhuiya, Z. H., M. N. Islam and M.A. Sattar. **1973. Effect of N, P, and K fertilizers on the yield and protein content of rice.** *Ind. J. Agr. Sci. (in press).*

A fertilizer trial on the grain straw yield and protein content of rice was conducted with three rates of nitrogen, two rates of phosphorus and two rates of potassium in the Noncalcareous Dark Grey Floodplain soil of Bangladesh Agricultural University Farm, Mymensingh during the months of May to August, 1972. The application of nitrogen progressively and significantly increased the grain and straw yields and grain protein contents. The application of phosphorus and potassium did not produce any significant effect on the grain, straw yield and protein content.

Agr. 576 Bhuiya, Z. H., A.K.M. N. Islam and M.S. Islam. 1973. **Yield and protein content of ir-8 rice as influenced by n, p and k fertilizers.** *Bangladesh J. Agr. Sci. (in Press).*

A fertilizer trial on the grain, and straw and protein content of rice conducted with three levels of potassium in the Noncalcareous Dark Gryey Floodplain soil of Bangladesh Agricultural University Farm, Mymensingh during the months of May to September, 1972. The application of nitrogen progressively and significantly increased the grain and straw yield and protein content in grain. The application of phosphorus and potassium did not produce any significant effect on the grain and straw yield and protein content.

Agr. 577 Idris, M. and A. K. Majumder. 1973. **Field Studies on the Effect of N P K Balance of Soil on the Growth and Yield of Rice.** *Bangladesh J. Sci. Ind. Res. 8 (1-4).*

A field study of the effect high level of fertilization at different relative N; P₂O₅; K₂O ratios of soil on the growth and yield of rice plants was made. The variety of rice Naizersail, employed in the investigation tolerated a high fertility level, the highest level being 240 pounds of nitrogen per acre, 720 pounds of P₂O₅ per acre and 240 pounds of K₂O per acre. A notably favourable change in general growth conditions, the tillering and earing of the plants was obtained after the soil was brought to the stipulated N P K ratios. The maximum growth with respect to height and tillering was obtained at the N: P₂O₅ : K₂O ratios 1:2:2. The balancing of N P K of soil to the stipulated ratios also brought about a remarkable increase in the yield of rice. The ratio 1:2:2 showing the maximum growth also produced the highest straw and grain yield. The grain yield at this ratio was about 1.7 times of that under the control.

Agr. 578 Islam, M. N. 1973. **A Study on the Effect of N, P and K Fertilizers on the Yield and Protein Content of Rice (Variety Dhariyal).** *M. Sc. (Ag.) Thesis. Bangladesh Agrar. Univ. (MS). 68 p.*

An experiment was conducted in the Bangladesh Agricultural University, Farm, Mymensingh with 3 levels of N, 2 levels of P₂O₅ and 2 levels of K₂O to study the yield and yield contributing characters of rice. The height of plants and number of tillers increased with NPK applications. The yield and straw and grain protein increased significantly with nitrogen application. NP effects on grain was also significant, P₂O₅ and K₂O effects were not significant on grain and straw yield. The number of panicle and 1,000 grain weight were also significant on fertilizer applications.

Agr. 579 Khan, D. H., M. Eaquad, and Ali, M. I. 1973. **Cation-anion relationships in two gramineae crops (*oryza sativa* and *brachinia mutica*) grown in a brhmaputra deltaic soil of Bangladesh.** *Z. Acker and Pfldnzenbau (West Germany)*. 137: 250-257.

The experiments were carried out in the Agricultural University farm area at Mymensingh and rice (Nizershail) and grass (para grass) were used as plant materials, cation-anion relationships in the nutrition of rice and grass were studied. The effects of N, P and K fertilizers on the antagonism and synergicism between the nutrient elements were also observed.

Agr. 580 Majumder, A.A. 1973. **The Effect of Some Inputs on the Production Level of IRRI shail (IR-5 32-E-5.76).** *M. Sc. (Ag.) Thesis. Bangladesh Agr. Univ. (MS)*. 45 p.

An experiment was conducted at Bangladesh Rice Research Institute Farm, Joydebpur, Dacca, during Aman season of 1972 using IRRI shail with their inputs viz. balanced doses of fertilizer (100-80-60), intercultural practices and post control. The percentage increase due to three inputs over the control, was 48.7, 4.9 and 1.4 respectively. Fertilizer when combined with cultural practices produced 48.0 P.C. of the total yield and 58.0 P.C. over the control. Similarly, when fertilizer was used with plant protection measures the yield was 77.8 P.C. of the total and 52.8 P.C. more of the control. When all of these inputs were used the yield increase to 45 maunds more than that of the control.

Agr. 581 Talukder, S. 1973. **A Study on the Effects of Split Application of Urea-N on the Growth and Yield of Rice (Variety Ir-20) In Aman Season.** *M. Sc. (Ag.) Thesis. Bangladesh Agr. Univ. (MS)*. 35 p.

A study was made at the Bangladesh Agricultural University Farm, Mymensingh during the aman season of 1972 to study the split application of different doses of urea-N on the growth and yield of rice. Results revealed that plant height was increased with increasing rates of urea-N application. An increase in the levels of urea-N resulted in the decrease of panicle length. The grain yield was increased significantly with increasing rates of applied urea-N. The rates of increase of the straw yield was higher with 120 lbs. of urea-N application with 3 splits.

Agr. 582 Mohammad, M. 1973. **To Study The Effect of Algae on Exotic and Local Varieties of Rice At Different Levels of Fertilizers.** *M. Sc. (Ag.) Thesis. Bangladesh Agr. Univ. (MS)*. 39 p.

An experiment was conducted in Bangladesh Agricultural University, Farm, Mymensingh in the year 1972, during the aman season to study the effect of algae on exotic and local varieties of rice and different levels of fertilizers. The grain yield obtain by harvesting were not found

to be significant due to the effect of algae individually on both the local and exotic varieties of rice. The variety had significant effect in respect of plant height, panicle length, and ear bearing tiller, fertile grain, grain and straw yield. Nizershail found to be superior over the IR-20 in respect of the above characters. The fertilizer levels showed significant effect on some characters. The levels 100:80:40 lbs., gave the highest yield and the levels 120:60:40 gave the highest straw yield.

Pathology

Agr. 583 Zaman, H.A. and Q. A. Ahmed. 1961. **Studies on the comparative tolerance and susceptibility of a few varieties of Rice to an Isolate of Helminthosporium Oryzae.** *Agr. Pakistan* 7 (2) : 264-272.

From the experimental field of the Agricultural Research Institute, Dhaka, rice plants with brown-spot symptoms were collected for isolation of *Helminthosporium oryzae*. The pathogenicity of this fungus was tested on 16 variety of rice. Several methods were used and in all tests variety could not escape from the infection. Among the 16 candidate varieties Jhingasail, Indrasail X Patnai 23, were found less susceptible and Latisail and Latishail. X Ashahi appeared to be highly susceptible to the disease.

Agr. 584 Bakr, A. and M. A. Wadud Mian. 1968. **A Survey of Various Fungal Diseases of Rice Occurring In the East Pakistan Agricultural University Farm.** *M. Sc. (Ag.) Thesis. East Pakistan Agr. Univ. 51 p.*

Diseases of rice due to *Helminthosporium oryzae* occurred during all the three growing seasons (Aus, Aman and Boro) of 1967-68, while diseases due to *Fusarium sp.*, *Pyricularia oryzae*, *Ustilaginoidae virens* and *Cercospora oryzae* occurred during Aus, early Aman, Aman and late Aus seasons, respectively. During the survey period Helminthosporiose of rice was found to be the most predominant disease in the field Frequent association of *Trichoconis padwickii* was noted in the leaves of IR-8 variety of rice. This fungus developed yellowish discolouration of the detached leaves of IR-8 in vitro.

Agr. 585 Talukdar, M. J. 1968. **Effect of fungicidal sprays on the control of blast disease of rice caused by pyricularia oryzae cav.** *Proc. 20th Pakistan Sci. Conf. Abs. Sec. Biol. C-50.*

Blast is one of the most destructive diseases of rice occurring in East Pakistan. The incidence of the disease is becoming more and more widespread every year with increasing severity. Infection takes place in the form of spots on the leaves, leaf sheath, stem and grains. The most serious phase of the disease is the neck infection at the base of the maturing inflorescence above the flag leaf. Complete failure of crop may result from such neck infection as the grains cannot fill up in the infected ear. No successful direct control of this serious disease has so far been possible with general fungicides. In recent years a few firms have been claiming to have

developed foliage fungicides specifically meant for controlling blast disease of rice. Experiments were, therefore, conducted to test a few such fungicides and assess their performance in controlling the disease. Results, so far obtained during the last 2 years field trials, showed that among the fungicides tested, two antibiotic preparations viz. Blasticidin-S and Ksumin when applied at 1 lbs. in 100 gallons of water per acre, gave comparatively better results followed by Du-Ter, a tin compound. Reduced leaf infection varying from 30 to 45 percent was obtained when the rice plants were sprayed with the above fungicides.

Agr. 586 Talukdar, M. J. 1968. **Studies On The Comparative Effectiveness Of Mercurial And Non-Mercurial Seed Dressings On Stand Of Seedlings And Yield Of Aus Paddy.** *Proc. 20th Pakistan Sci. Conf. Abs. Sec. Biol. C-50-51.*

Organo-mercurial seed dressings viz. Granosan 'M' and Agrosan 5W have been recommended for general seed treatment of rice in East Pakistan. These chemicals are deadly poisonous and as such it is essential that the suggested precautionary measures are to be followed strictly. It has, however, been observed that those chemicals are generally handled by the illiterate labourers who very often fail to take sufficient precautionary measures resulting in serious consequences. It was, therefore, felt necessary to replace these chemicals by comparatively less toxic substances having equal effectiveness. With this end in view experiments were conducted to test the following seed dressings:

1. Granosan 'M' at 1 oz. per maund of seeds. (MERCURIAL).
2. Agrosan 5w at 1 oz. " -do-
3. Arasan SFX at 2 ozs. " -do-
4. Fernasan 75W at 3 ozs. " -do-
5. Brassicol at 3 ozs. " (PCNB)
6. Orthocide at 3 ozs. " (CAPTAN)

The above treatments together with control were replicated 4 times. The results showed that all the chemical had highly significant effect in increasing the stand of seedlings per unit area with consequent higher yields than control. But none of the nonmercurials tested was found as effective as the mercurials. Fernasan 75W, however, gave best results among the non-mercurials. This chemical may be used for rice seed treatment in those places where use of mercurials is thought hazardous.

Agr. 587 Talukdar, M. J. and M.A.M. Mian. 1968. **Studies On The Resistance Of Rice Varieties To Blast Disease In Seedling Stage.** *Proc. 20th Pakistan Sci. Conf. Abs. Sec. Biol. C-51.*

An experiment for selecting rice varieties resistant to blast disease was conducted during the year 1966 in co-operation with the Economic Botanist (Cereals). Seeds of most of the varieties tested were supplied by the International Rice Research Institute, the Philippines. The varieties tested may be grouped as under :-

- I. Varieties selected for International Blast nurseries by IRRI. Number of varieties=240.
- II. Varieties which showed resistance to blast disease when tested at Los Banos, the Philippines. Number of varieties=300.
- III. Varieties supplied by the Economic Botanist (Cereals). Number of varieties=61.

The reactions of different varieties to the disease were classified according to the standard scale unit of International Rice Research Institute, the Philippines. In group I, 89 varieties were found to be resistant out of 246 varieties tested. In group II, 166 varieties showed resistance to the disease out of 300 tested. In group III, 23 varieties were found to be resistant out of 61 varieties.

Agr. 588 Galvez-E, G.E. and M.S.A. Miah. 1969. **Virus And Mycoplasma-Like Diseases Of Rice In East Pakistan.** *Int. Rice Comm. News Letter. 18 (4) : 18-23.*

Transmission tests demonstrated the presence of the tungro virus and yellow dwarf diseases in East Pakistan. The vector of both diseases was the rice green leaf-hopper *Nephotettix impicticeps* Ishihara which represented 95% of the insects collected in the paddy fields. The rice tungro virus was also the most prevalent and important disease damaging the Aman crop. The symptoms on the variety FK135 resembled those of the severe strain of the rice tungro virus in the Philippines, but the reaction of some varieties such as Pankhari 205 suggested the presence of a new strain. The virus was consistently isolated from native (Ltisail, Nigershail) and IRRI varieties grown in Savar, Joydevpur, Mymensingh, Comilla, and Dhaka. The disease was epiphytotic in some of these areas.

Agr. 589 QU, S.H., F.L. Nuque, T.T. Ebron. Jr. and M. Quamaruzzaman. 1969. **New Pathogenic Races Of Pyricularia Oryzae In The Philippines.** *Philippine Phytopathol. 5p.*

Studies on the pathogenic races of the blast fungus have been pursued to obtain more information relevant to breeding for disease resistant varieties. Two sets of differential varieties (Philippine and International) were employed to distinguish races. From 1965 to

1967, 88 pathogenic races based on the two sets of differentials have been reported. In 1968, 3 new races based on the pathologic reactions of the Philippine differential varieties, were distinguished. Among the newly identified races, P-106 is the most frequently isolated, followed by P105, P92, P90, P111 and P112. Races P89, P92, and P103 were most virulent. Race P89 was pathogenic to the Philippine differential varieties except Wagwag which was resistant. Race P96 appeared to be the least virulent; it incited susceptible reaction in only 3 Philippine differential varieties viz., Khao Tah Haeng-17, Raminad str.3, and Wagwag. Based on the international differentials, 11 new pathogenic races were identified. Of these, IA-67 proved to be common, followed by IA-97, IA-96 etc. The most virulent were races IA-67 and IA-97 whereas IF-2, IF-3 and IA-124 were the least virulent. Race IA-67 infected 6 differential varieties; it did not infect Zenith and CI-8970(s). Race IA-97 was pathogenic to all save and except Zenith and NP-125. IF-2 was pathogenic only to Kanto 51 and CI-1561. There are now 118 pathogenic races and 67 race groups in the Philippines based on the pathologic reactions of the Philippine and international differential varieties.

Agr. 590 Zaman, H.A. and K. Joinuddin. 1969. **Comparative resistance of some local and imported rice varieties to seedling blight caused by *Helminthosporium Oryzae*.** *Pakistan J. Biol. Agr. Sci.* 12 (1) : 58-64.

Four fungal organisms (*Helminthosporium*, *Curvularia*, *Fusarium* and *Phoma*) were isolated from diseased Dharial rice seeds collected from the East Pakistan Agricultural University Farm. Among these fungi *Helminthosporium* was the commonest one in association with the diseased seeds. The relative resistance of 20 varieties of rice to seedling blight disease caused by *Helminthosporium oryzae* was evaluated in the Laboratory in petridish and pot experiments. Harinmuda and IRRI-8 were found resistant compared to other varieties.

Agr. 591 Quamaruzzaman, M. and S. H. Qu. 1970. **Monthly changes of pathogenic races of *Pyricularia oryzae* in a blast nursery.** *Phytopathol.* 60 : 1266-1269.

A total of 363 monoconidial cultures of *Pyricularia oryzae* were isolated from diseased leaf samples collected monthly for 21 consecutive months from the blast nursery at the Institute (IRRI). These isolates when individually on the 8 international and the 12 Philippines differential rice cultivars, were differentiated into 37 and 60 pathogenic races, respectively. The number, composition, and frequency of races varied greatly between months as determined by the isolates. A few prevalent races appeared in most of the months, some intermittently, and others only once during the 21 month period. The qualitative and quantitative changes of the races which occur in a blast nursery suggest the need for repeated tests to screen cultivars resistant to blast and explain why some cultivars resistant in the early stages of growth become susceptible at the flowering stage in fields.

Agr. 592 Bakr, M. A. 1972. **Effects of nutritional factors on the virulence of *Xanthomonas oryzae* (Ueda and Ishiyama) Dowson.** *M.S. Thesis. Univ. Hawaii, 50 p.*

Cultivation of six isolates of *X. oryzae* by serial transfers on basal agar media differing in carbon and nitrogen sources which supported good growth of the bacterium, resulted in an attenuation of virulence of all the isolates, while virulence of the pathogen did not alter when maintained by serial transfers on Wakimoto's medium, a semisynthetic potato-peptone containing medium. The reduction of virulence was greater when the bacterium was cultured on sodium succinate and valine media and less on cystine and casein hydrolysate or a combination ; glutamate, cystine, aspartate and methionine media. For restoring the virulence of the pathogen in storage, suitable media should be selected.

Agr. 593 Hossain, M. M. and M. A. Wadud Mian. 1972. **Fungal population of some Horticultural field soils.** *M. Sc. (Ag.) Thesis. Bangladesh Agr. Univ. (MS). 35 p.*

Estimated fungal population in soils from potato, sweet potato, tomato, bean, cabbage and papaya fields showed 34,625, 37,250, 50,375, 37,625, 46,813 and 44,000 colonies/g of dry soil, respectively, in PDA medium and the corresponding figures obtained for Peptone Dextrose Agar medium were 45,000, 53,375, 68,625, 135, 625, 100,250 and 99,375. Significant differences in levels of fungal population among the fields indicated influence of crop sequence on population build up. Relatively higher recovery of fungi from bean field soil strongly suggested that bean root secretions enhanced rhizosphere fungal population. Maximum number of sclerotic of *Sclerotium rolfsii* was recovered from potato field soil followed by cabbage, tomato, sweet potato, papaya and bean fields. High sclerotial population in potato, cabbage and tomato fields was due to continuous cultivation of crops susceptible to *S. rolfsii*.

Agr. 594 Islam, T. and H. Ashrafuzzaman. 1972. **Varietal screening under field conditions for disease resistance in rice III. Testing of rice strains/varieties for resistance to bacterial leaf blight bacterial leaf streak and leaf yellowing.** *M. Sc. (Ag.) Thesis. Bangladesh Agr. Univ. (MS). 64 p.*

In order to develop improved rice varieties, 212 selections of rice, collected from International Rice Research Institute were grown in the experimental farm of Bangladesh Agricultural University. The experiment was conducted over a period of three seasons. The selections were observed for appearance of different disease namely, brown spot, blast, false smut, leaf smut, bacterial leaf blight, bacterial leaf streak, bronzing of leaves, yellowing of leaves, tungro and orange leaf virus during the seasons. Variation in disease attack in different seasons was observed in some selections. Narrow brown leaf spot, brown spot, false smut, and bronzing of leaves appeared at later stages of growth and caused little harm to the plants. Tungro and orange leaf were recorded in some of a few selections. Some diseases were not found in all seasons. The selections were, however, graded against the most prevalent diseases. Nineteen selections were resistant to bacterial leaf blight in two seasons and 58 strains were resistant to this disease. Yellowing of disease was completely absent in four lines.

Agr. 595 Rob, M.A., H. Ashrafuzzaman, and M.U. Ahmed. 1972. **Chemical control of rice node-blast with blastin and Kasumin.** *M. Sc. (Ag.) Thesis. Bangladesh Agr. Univ. (MS).*

Blast caused by *Pyricularia oryzae* is an internationally important rice disease and causes damage to leaf and the first node of the panicle. The incidence of node-blast responsible for greater yield reduction depends on the severity of leaf-blast. In 1972, an aman rice (Latishail) plot of University farm, heavily infected with leaf-blast was sprayed with Blastin and Kasumin to determine their effectiveness in controlling node-blast. The fungicides were tested in a statistically designed plots of 25" X 15". The merits of single, double and triple fungicidal application made at different stages of growth of plants such as first heading, full heading and 7 days after full heading were assessed. Both fungicides controlled node-blast, but Blastin was superior to Kasumin. The node infection decreased as the number of fungicidal application increased and the increase in yield was positively correlated with the reduction of node-blast. The increase in yield though was obtained with increase number of application, the statistical data indicated the economical superiority of two applications over the three. To conclude: Blastin should be sprayed at first heading and full heading stages of growth of rice plants for effective control of blast.

Agr. 596 Ahmed, H.U. and M. Huq. 1973. **Disease reactions of iratom rice. I. Bacterial leaf blight and blast.** *Nucl. Sci. Appl. 7 (In Press).*

IRATOM-24, IRATOM-38 and the mother variety IR8 were tested through artificial inoculation with pathogens *Xanthomonas oryzae*, the causal organism of bacterial leaf blight and *Pyricularia oryzae*, blast fungus. All of them were susceptible to blight and moderately resistant to blast.

Agr. 597 Mia, S.A. and M. Q. Zaman. 1973. **Studies on the reaction of high yielding dwarf rice to foot-rot and bakanae in Bangladesh.** *Bangladesh J. Bot. 2 (2): 73.*

Foot rot or bakanae disease of rice plant occurs in Bangladesh for a long time. Varieties differ in their exhibition of symptoms after infection. Some promising IRRI lines such as IR 272, IR 253, etc. were found to be susceptible and IR 8 was found to be resistant to this disease. The plants may be infected from inoculum present in the seed or soil. Though Seto reported that bakanae symptom does not appear at temperatures lower than 20°C. It was however, found that bakanae disease might break out in the cold winter season when night temperature ranged between 7°C-13°C. Seed treatment could prevent infection temporarily; but soil borne inocula might infect the plants later.

Seventy-one and 67 thousand fungal clones/g of dry soil were isolated from the peanut field during October and July assay periods, respectively. Isolation in October from the rice fields showing heavy, moderate and no infection of rice plants indicated fungal populations of 209.4, 95.8 and 92.8 thousand colonies/g of dry soil, respectively. The corresponding populations for rice fields in July were 41.8, 33.4 and 38.2 thousand colonies/g of dry soil.

One hundred twenty three species of fungi belonging to 43 genera and 12 unidentified species were isolated from rice and peanut field soils. High population of fungi in the soil of heavily infected rice field was due to gradual incorporation of additional substrate to the soil by the progressively dying roots of the diseased rice plants, which enhanced the growth and sporulation of the selective soil-inhabiting and soil invading fungi. Seasonal variation in fungal populations was pronounced in the low-lying rice fields; consistently higher populations were observed during the dry season than in the wet monsoon. Almost identical levels of fungal populations were recorded from the peanut field soil, located on a high land, during both the assay periods.

Physiology

Agr. 599 Salahuddin, A.B.M. and A. Alim. 1967. **A study on the effect of photoperiod on the shoot apex and panicle development of three varieties of transplant aman paddy. viz. da-31, DA-17, AND DA-25.** *M. Sc. (Ag.) Thesis. East Pakistan Agr. Univ. (MS). 107 p.*

The effect of photoperiod on the three varieties of transplant Aman paddy namely, D-31 Latisail, and Nizarshail was investigated both in pot culture and in the laboratory of Economic Botanist, Cereals, Dacca. Observations were made on the duration of first panicle emergence, plant height, number and percentage of ear bearing tillers per plant, panicle length, number and percentage of fertile grains per panicle, grain size, grain yield per plant and thousand grain weight, the panicle development, its liner growth from transformation of shoot apex to panicle primordial stage and then to its, full emergence, and the duration from sowing to panicle initiation and then to its full emergence. Eight hours of photoperiod was found optimum for early ear emergence in all the three varieties. Less tiller, low yield per plant and less grain per panicle under short photoperiod were observed in all the varieties. The variation in the photoperiod from the optimum resulted in the reduction of plant height, panicle length, percentage of ear bearing tillers and fertile grains, and thousand grain weight in case of Tiscali and Naizarshail. The effect of different photoperiods on grain size was not much pronounced. The linear growth rate of the panicle at both stages of observation was more rapid under short photoperiods than the longer ones. Eight hours of photoperiod was found optimum for early panicle development.

Agr. 600 Bhowmik, J.C. and S.H. Chowdhury. 1968. **Effect of cycocel, (2-chloroethyl) trimethyl-ammonium chloride on vegetative and reproductive growth of tall and dwarf varieties of rice.** *M. Sc. (Ag.) Thesis. East Pakistan Agr. Univ. (MS). 78 p.*

The experiment was carried out in pot culture at the East Pakistan Agricultural University, Mymensingh. The effect of Cycocel and fertilizer was tested in terms of various yield contributing morphological and physiological characters in Dhariail (Aus) and Naizarshail (Aman) for tall varieties, and IRRI-8-288-3 fir dwarf variety if rice. The only significant effect of Cycocel was found on the vegetative growth of Aman rice in reducing the final height attained. But the decrease in yield consequent upon reduction of vegetative growth due

to Cycocel treatment as reported by other workers was not observed in these experiments. The fertilizer effect was positive but it has no interaction with that of Cycocel. This showed that the action of Cycocel is quite independent of the level of fertilizer and, therefore, it can be applied with advantage whatever be the degree of fertility of the soil where the crop is grown.

Agr. 601 Chakravarty, N.K. and A. A. A. Muhsi. 1968. **A study of the relationship between chlorophyll content and yield of different varieties of Aus paddy.** *M. Sc. (Ag.) Thesis. East Pakistan Agr. Univ. (MS). 48 p.*

The study was conducted at the East Pakistan Agricultural University Farm in 1967 to study the relationship between chlorophyll content and yield of two recommended varieties of Aus paddy namely Hashikalmi and Kataktara. The study included general survey of the morphological characters such as leaf length, leaf breadth, leaf angle, and leaf area along with a chemical analysis of the chlorophyll of leaf. The different nitrogen doses ad pronounced effect on the leaf length of both the varieties. The length and breadth of first and second leaf increased with each successive increased dose of nitrogen. The kataktara had greater leaf area for first and second leaf breadth over Hashikalmi. Leaf length for first and second leaf was also found to increase with increasing dose of nitrogen. The angle between the first leaf and culm showed a contrary to the above finding. The study indicated that chlorophyll content in the leaves increased with the successive increased dose of nitrogen. Kataktara had more chlorophyll content than Hashikalmi. It was interpreted that increase in leaf area, leaf angle and chlorophyll content contribute towards, more photosynthesis and consequently more towards grain yield.

Agr. 602 Haq, A. 1968. **Effect of cycocel (2-chloroethyl trimethyl ammonium chloride) on the growth of rice plants.** *Proc. 20th Pakistan Sci. Conf. Abs. Sec. Agr. A-35-36.*

Cycocel 2, chloroethyl trimethyl ammonium chloride, also known as Cycocel or CCC is a plant growth regulant which produces unusual and varied responses in plants. The treated plants generally become compact, sturdy and short and remain dwarfed under optimal watering and fertilization. If dwarfening can be affected in rice plants, then lodging which is a great drawback with some of the rice varieties due to their tall nature, can be triumphed over and under conditions of optimal watering and high fertilization, the plants would not lodge and as such, higher out turn can be obtained. With this end in view, the present study was undertaken during the year 1965-66 and 1966-67. A recommended Aus paddy named "Kataktara" was used in the experiment and Cycocel 50% was sprayed on the foliar plants at the 2-3 and 4-5 leaf-stage of the plants in the first season of the crop-study at three different doses, e.g., 1 lbs. 3 lbs. and 4 lbs. of the chemical per acre. In the following season, the experiment was repeated with some modifications in dosages sprayed at various number of leaf-stages of the plants. The results obtained in both the seasons indicated no appreciable different in the performances of the plant especially in the height of the plants.

Agr. 603 Khan, A.B. 1968. **Studies on the physiology and nutrition of rice plants relating to the absorption of C¹⁴ and N¹⁵.** *Proc. 20th Pakistan Sci. Conf. Abs. Sec. Agr. A-20.*

One of the most important constituent of chlorophyll is nitrogen and naturally it can be expected that low chlorophyll would result when the plant is in deficit supply of this particular element. In spite of intensive research, throughout the world, on photosynthesis and carbon assimilation, much information is not available on the direct relationship between nitrogen status of the plant tissues and the photosynthetic activities of carbon absorption. An experiment was conducted in the greenhouse using rice plant grown on sand-culture up to the tillering stage with added nutrient solution. Carefully washed plants were kept in tap water for two days and then grown in nutrient solution for seven days. The sets of plants with and without nitrogen were created on which C¹⁴ as glucose, sucrose and gas were applied. In some cases, C¹⁴ gas was superimposed on the plants which have already received glucose, and sucrose. Plants were kept under light and dark conditions maintaining the temperature at 30°C. Auto-radiograph and radio chemical analysis of plants for C¹⁴ and chemical analysis for total N and N¹⁵ led to the following conclusions:-

- (1) Downward movement of C¹⁴ from gas absorbed by leaves are faster than that from root to leaf when applied as solution.
- (2) Nitrogen deficiency decreases the absorption of C¹⁴ both from gas and solution.
- (3) Older roots retain the absorbed carbon more, while younger roots translocate it rapidly to the aerial parts.
- (4) Carbon application increased the uptake of C¹⁵ by the plants.
- (5) Darkness reduced C¹⁴ content more in case of solution application than in the case of gas.

Agr. 604 Khan, M.A.A., S.A. Hamid and M.A. Hussain. 1969. **Effects of induced drought on rice plants.** *Pakistan J. Biol. Agr. Sci.* 12 (1): 1-22.

A study was undertaken to find out the effect on the vegetative growth, tiller formation, flowering time and yield of IR8, Dhariyal, Dular and Marichbati brought out by a single drought induced at various stages in the life of plants. The increase of the grain yield which took place over the control in IR-8, Dhariyal and Dular due to the drought induced within three weeks after germination of seeds appeared primarily to be a direct result of the increase of tillers. The yield decreased in IR-8 by drought between 26 and 63 days; in Dhariyal between 18 and 51 days; in Dular between 38 and 60 days and in Marichbati up to 64 days mostly due to the reduction in the effective tillers, filled grain and 1,000 grain weight.

Agr.605 Khan, S.M.A. and S.H. Choudhury. 1972. **Effect of cycocel, (2-chloroethyl trimethyl ammonium chloride) and its interaction with nitrogenous fertilizer on the growth and yield of rice.** *M. Sc. (Ag.) Thesis. Bangladesh Agr. Univ. (MS). 61 p.*

Cycocel, (2-chloro-ethyl)-trimethyl ammonium chloride, also known as CCC was tested for the evaluation of its effect on growth and yield of rice in aman season. Experimental materials were Nizershail and Latisail, both being moderately tall varieties. The experiment was laid down in the Bangladesh Agricultural University farm at Mymensingh. Cycocel was applied as liquid sprays during peak period of vegetative growth. Nitrogenous fertilizer in two levels was applied after transplantation to test the interaction between the effect of cycocel and of fertilizer. The effect of cycocel in conjunction with nitrogenous fertilizer was tested in terms of various yield contributing morphological and physiological characters. The significant growth in reducing final height attained leading to the reduction in yield for both Naizershail and Latisail. The effect of fertilizer was positive and it had interaction with that of Cycocel for some of the characters studied. Though Cycocel produced stem shortening, it reduced final yield not to speak of any increase in yield. Therefore, it cannot be recommended as an antilodging chemical to be tried on rice.

Miscellaneous

Agr. 606 Alim, A. and M.A. Chaudhury. 1962. **Studies on the yield growth and development of different varieties of deep water aman paddy in different situations of land.** *Proc. 14th Pakistan Sci. Conf. Abs. Sec. Agr. A-105.*

Questions have been posed many a times by Rice experts of international farm as to how the deep water paddies behave in different situations of water depth as to their growth, development and yield. The behaviour of deep water paddy at different situations though known to a certain extent but it was never studied based on experiment. So an experiment was laid out at Habiganj deep water paddy experimental station to find this answers. Four varieties of typical deep water paddies were grown in three situations of land where water depth varied from 4' to 12', for a period of 4 years. Observations were taken on the yield of different varieties grown in situations of water depth. The conclusion arrived at is this, that there is no significant difference in yield among the varieties in the same situation or among the situations. In other words, the yield is not affected by water depth. The varieties differ in their plant height. It however, increases with the increase in water depth in all varieties. The different varieties have different capacity for such increase in height. The increase in height of different varieties from situation one to two varied from 35% to 47.9% and in situation 1 to 3 from 46% to 60.1%. This variation increase in height shows an indication of flood tolerant capacity of varieties.

Agr. 607 Alim, A., T. Ullah and A. Majid. 1962. **Performance of exotic varieties of rice under Dacca farm condition.** Proc. 14th Pakistan Sci. Conf. Abs. A-105-106.

Two sets of varietal trials commonly known as International Co-operative varietal trials were carried out at Dacca Experimental Station for a period of 3 years during the transplanting Aman season of 1957-58, 1958-59 and 1959-60. Rice Commission of the F.A.O. of the United Nations collected recommended strains from different rice growing countries of South East Asia. It was intended that these varieties be put under varietal trial to find out their performance. In one set of trial 8 early and medium maturity varieties were tried against our standard recommended variety Latisail of similar maturity. In another set 6 late varieties were tried against our standard recommended variety Nizershail of the same maturity. It was observed during all the years that in both sets of trials our recommended strains gave significantly higher yield than the varieties recommended through F.A.O. So, the conclusion is that our varieties perform better than the recommended varieties of other countries in our climatic and environmental condition. It was further observed that the introduced varieties performed well in first year and in the subsequent years their yield declined to a very great extent. This is because the exotic varieties deteriorated rapidly in the new environment. So, the question of acclimatization is important and varieties introduced should not be put under trial immediately after introduction without acclimatizing them.

Agar. 608 Begum, T. 1965. **Rice cultivation in Brora Thana.** Proc. 17th Pakistan Sci. Conf. Abs. A-71-72.

The land use survey of Brora thane was done by visualising the actual phenomena of the area by moving from field to field. The author made a direct contact with the farmers, the owner of the land, and got the required geographical information from them adopting a questionnaire method. It is an intensive geographical study of a small area of Comilla District, East Pakistan.

Agr. 609 Baten, K.A. and A. Alim. 1969. **Effect of age of seedlings on the yield of transplant Aman paddy.** M. Sc. (Ag.) Thesis. East Pakistan Agr. Univ. (MS). 59 p.

An experiment was designed to study the effect of six different ages of seedlings on the yield and other yield contributing characters of three transplant Aman varieties, Badkalamkati, Latisail, and Nizershail. The ages of the seedlings were 15, 25, 35, 45, 55 and 65 days. The experiment was conducted in a split plot design at the East Pakistan (Bangladesh) Agriculture Research Institute Farm Dacca during the Aman season of 1966-67. The object of the study was to find out the best age of seedlings for transplantation. Various plant characters such as plant height, number of total tillers and fertile tillers per plant, length of panicle, number of fertile and sterile spikelets per panicle, thousand spikelets weight yield of grain per acre and yield of straw per plot were studied. Compared to all other ages of seedlings 33 day old seedlings gave highest number of fertile spikelets per panicle and higher 1000 spikelets weight. The yield obtained from 35 day and 45 day old seedlings did not differ significantly

though numerically the highest yield of 2413.28 lbs., per acre was obtained when transplanting was done with 35 day old seedlings. The yields from all other ages of seedlings were inferior to that obtained from 35 day old seedlings.

Agr. 610 Latif, M.A. 1969. **Evaluation of some seed testing methods to determine the emergence potential of rice seed under field condition.** *M. Sc. (Ag.) Thesis. East Pakistan Agr. Univ. (MS).* 97 p.

Habiganj-4, a boro rice variety seeds were stored at room temperature under 4 storage conditions: control, 31, 52 and 80% relative humidity for a period of 9 months. The storage under control and 31% relative humidity was satisfactory throughout the entire 9 month period. 5 measures used to list the quality of seeds. The germination under the field conditions was best index to measure seed quality of rice, standard germination test was ineffective and the tertrazolium test can be used to obtain quickly a first hand information about the exact physiological condition of seeds.

Agr. 611 Mamun, A.A. 1969. **Evaluation of stam F-34, rogue, planavin, prefix, 2, 4-D and gramoxone as weedicides in normal and plough less farming in rice.** *M. Sc. (Ag.) Thesis. East Pakistan Agr. Univ. (MS).* 79 p.

Two experiments were conducted in the East Pakistan Agricultural University Farm, Mymensingh for evaluating some weedicides on Aus and T. aman rice. Stam, F-34 and Rogue gave more or less satisfactory weed control where planavin and 2, 4-D provided unsatisfactory results during Aus season. Hand weeded crop produced the highest yield which was followed by Stam F-34. In the Aman rice Stam F-34 and Rogue produced significantly higher yield with a good control of the infesting weeds. 2, 4-D although showed complete control of all the infested species of weeds it tended to depress yield due to its physio-toxic effects upon rice plants.

Agr. 612 Rahman, M.A. 1969. **Chemical weed control in rice.** *M. Sc. (Ag.) Thesis. East Pakistan Agr. Univ. (MS).* 61 p.

Two experiments, one with aus rice and other with transplant aman rice were carried at the Agronomy Field Laboratory of the Bangladesh Agricultural University at Mymensingh in the year 1968. The treatments were weed control by Stam F-34, Rogue, Planavin, Prefix, 2, 4-D, hand weeding and no weeding in each of the experiment. Stam F-34 was found to be the best for controlling weeds in Aus rice and to 2, 4-D for Aman rice. Moreover, Rogue, 2, 4-D and planavin had little effect on weeds during Aus rice and Rogue, Stam F-34, Planavin and Prefix in the Aman rice.

Agr. 613 Hussain, M.S. and A. L. Mian. 1970. **Evaluation of stam F-34, planavin and paraquat as weed killers and as substitute for land tillage in production of rice.** *M. Sc. (Ag.) Thesis. East Pakistan Agr. Univ. (MS). 74 p.*

A study consisting of two experiments, was conducted at the Agronomy Field Laboratory of the East Pakistan Agricultural University of Mymensingh during the period from April to December, 1969. In one experiment, three herbicides, viz. Stam F-34, Rogue and Planavin were applied in Aus rice. Stam F-34 was found to be better than the rest of the two. The results from other experiment indicated that with the proper use of suitable herbicides (Stam F-34), the production of transplant Aman rice without preparatory land tillage might be increased significantly.

Agr. 614 Huq, A.K.M.F., S.H. Khan and M.A. Qasem. 1970. **Consumptive use coefficients (K) determination of transplanted Aus, Aman, and Boro rice for the Ganges-Kobadak area of East Pakistan.** *Pakistan J. Soil Sci. 6 (2) : 1-8.*

Consumptive-use for the transplanted Aus, Aman and Boro varieties of rice were determined for the years 1965, 1966 and 1967 at Amla Irrigation Experiment Station, Kushtia. There exists a direct relationship between the leaf area, metabolic activities within the plants and the amounts of water loss through transpiration. Water requirement of the rice plants are closely related with temperature and percent day time hours. The consumptive use coefficients (K) clearly indicate that the critical months, so far as water requirements are concerned for the growth of Aus, Aman and Boro crops are May, October and March respectively. The average, 'K' values for transplanted Aus, Aman and Boro for the 3 years are 1.59, 1.61 and 1.72 respectively.

Agr. 615 Hoque, M.M. and M. A. Choudhury. 1971. **Studies on the growth behaviour of root and shoot at different growth stages of four rice varieties.** *M. Sc. (Ag.) Thesis. East Pakistan Agr. Univ. (MS). 59 p.*

The experiment was conducted to study the growth behaviour of root and shoot at all growth stages under four different conditions. The varieties taken were IR 532-1-176 (V₁), IR5 (V₂), da-31 (V₃) and Nazarshail (V₄). The highest plant height was obtained from the variety V₄ followed by V₃, V₂ and V₁. The results from the mean of the plant heights indicated that plant height decreased with the increase in depth of tillage. The variety V₃ produced longest roots while V₄ produced the shortest roots. The length of roots was found positively correlated with the plant height. The variety V₄ gave significantly largest number of roots and V₃ gave significantly the last number of roots. The number of roots increased with the increase in depth of tillage. Number of roots was found to be highly correlated with the number of culms. The results provided evidence that thickness of root slightly increased with the increase in depth of tillage. Significant difference were observed in the number of photosynthesizing leaves obtained from the varieties of maturity. From the correlation studies it was found that the number of roots and culms were positively correlated. The length of root and plant height

were found correlated though in significant. The number of roots and photo-synthesizing leaves were found negatively correlated. The length of root with grain yield and straw weight were found negatively correlated.

Agr. 616 Sarker, A.U., M.A. Sadeque and M. Eunus, 1973. **Effect of irrigation on rice (*Oryza sativa* L.)** Res. Rep. Dep. Agron. Bangladesh Agr. Univ. (MS).

The study was aimed at to see the performances of one IRRI line IR758-15-2 in comparison with two varieties-IR8 and Mala under 10, 20,30,40,53 and 60 days intervals of irrigation. The experiment was laid out in a split-plot design at the farm of the Bangladesh Agricultural University, Mymensingh during the period from January to June 1973 with the varieties in the main plots and stages of irrigation in the unit plots of 1/290 acre each. The experiment was replicated thrice. The experiments crop was fertilized with 100lb N, 60lb P₂O₅ and 40lbK₂O/acre through urea, triple superphosphate and muriate of potash respectively. The 30 days old seedlings were planted maintaining 10" X 8" spacing and the crop was harvested variety-wise at maturity. The 10 days interval of irrigation came out to be best for grain-yield but the grain yield obtained due to 13, 20, 30, and 40 days intervals of irrigation was statistically identical. The grain yield obtained from 10 days and 20 days intervals of irrigation differed significantly from the obtained by the irrigation made after both 50 and 60 days intervals. The grain yield obtained from IR8 and IR 758-15-2 was identical but it was significantly different from that obtained from Mala.

Corn

Agr. 617 Ahmed, I.U. 1964. **Placement of fertilizer capsules for corn in plots.** *Pakistan J. Soil. Sci. 1* (1): 50-56.

A study was made to determine if capsulation of fertilizer with polyethylene film and placement in plots of corn would control the rate of release of fertilizer constituents more in line with the need of the plant and thereby increase the uptake of nutrients by reducing loss by fixations, leaching and as gas. In field studies with corn grown in small plot (consisted of 3 feet of row with 3 feet of border between consecutive plots in the same row) on Miami silt loam, capsules of 19-19-19 fertilizer gave increase in yield and recovery of N, P and K but because of small plot size and lack of sufficient replication, the increases were not statistically significant. The rate of release of fertilizer from capsules placed in the plots, was directly related to the number of pinholes per capsule and inversely related to the weight of the capsule. Capsules of fertilizer should prove satisfactory for trees, shrubs and other large plants where gradual release of fertilizer is desirable over a period of months or years particularly where serious leaching is caused by heavy rains. This method also appears to be applicable for potted plants.

Agr. 618 Islam, F. 1965. **A study on spacing, fertilizer and placement on corn.** *M. Sc. (Ag.) Thesis. East Pakistan Agr. Univ. (MS). 65 p.*

An experiment was conducted in the East Pakistan Agricultural University Farm, Mymensingh to study the effects of corn with two spacings, three fertilizer and three placements. Height of plants, number of ear per plant and grain weight were significantly increased with band placement of fertilizers. Broadcasting method produced least weight of grains per plant. Fertilizer and spacing interaction appeared significant where 40-75-70 and 10 inches spacing combination was superior to all and 30-55-70 and 8 inches spacing combination produced smallest plants.

Agr. 619 Bari, M.A. and A.M. Shamsuddin. 1968. **A study on the performance of two varieties of corn at different times of planting and plant spacing.** *M. Sc. (Ag.) Thesis. East Pakistan Agr. Univ. (MS). 98 p.*

A study was made in East Pakistan Agricultural University, Mymensingh Farm in 1967 with two varieties of corn, three times of planting and three dates of sowing to find out the effect of yield and yield contributing characters. Pop corn variety produced slightly higher grain yield than flint corn. Delay in planting reduced the grain yield. Different spacings did not show any appreciable effect on plant height. The maximum number of ears/plant was produced when the plants were produced by the pop corn.

Agr. 620 Main, A.L., M.F. Islam, and S.M.A. Hossain. 1969. **Effect of plant spacing and fertilizer placement in corn.** *Pakistan J. Biol. Agr. Sci. 12 (1): 65-69.*

Corn was grown at within-row plant-to-plant spacings of 8 and 10 inches at a constant row-spacing of 30 inches. The experimental plots were fertilized with three N. P. K. (all elemental) doses (lb./acre): (a) 30-24-58, (b) 35-28-66 and (c) 40-32-75. Fertilizers were placed in the soil in four different methods, namely, (a) single band, (b) double band, (c) plough sole, and (d) broadcast. Plant spacing and N.P.K. doses, as studied here, did not significantly influence the yield of corn. Fertilizer placement method significantly influenced corn yield. Band method, single or double, of fertilizer placements was found to be significantly superior to the other two methods of placement, plough-sole and broadcast-which were statistically identical to each other in the production or yield in corn.

Agr. 621 Rahman, L. 1972. **A study on the effects of different levels of nitrogen and dates of planting on three types of corn.** *M. Sc. (Ag.) Thesis. Bangladesh Agr. Univ. (MS). 64 p.*

An experiment was conducted in the year 1970-71 at Bangladesh Agricultural University, Farm, Mymensingh in the winter season to study the effect of different levels of nitrogen and dates of planting on 3 types of corn on the yield and yield contributing characters of corn. Flint corn on 1st

November planting with 120 lbs. of nitrogen/acre recorded the highest yield (3325.08 lbs.) followed by pop corn (3194.40 lbs.) and sweet corn (2824.14 lbs.) with the same condition. The early planting (16th November) was the best from the late planting (16th November) for the yield and mostly all the yield contributing characters of corn. Interaction due to dates of planting and types of corn were significant on the total number of ears matured per plant and average length per ear. From this study it is clear, that per acre yield is more influenced by dates of planting than doses of nitrogen and types of corn.

Maize

Agr. 622 Hossain, N. 1970. **A study on the heritability of some characters of maize.** *M. Sc. (Ag.) Thesis. East Pakistan Agr. Univ. (MS).* 76 p.

Heritability estimates of 10 characters of flint maize were obtained in the F_2 of the nine crosses of five inbred lines following the procedure of the analysis of variance components of the F_2 and the two back crosses B_1 and B_2 as $\text{Heritability} = (\frac{1}{2}D/VF_2) \times 100$, where $\frac{1}{2}D = 2VF_2 - (VB_1 + VB_2)$. The mean estimate of heritability of 64.3% for ear diameter was the highest followed by weight of 100 kernels, ear length, kernel yield, ear weight and days to ear with relatively high mean values of 61, 60, 57, 6, 55.9 and 52.7% respectively while it was moderate for days to tassel (47.2%). Plant height and number of ears per plant had considerable lower heritability values with the means of 32.9 and 32% respectively and the number of kernels per ear had the lowest mean value of 30.9%. Selection for days to tassel, days to ear, ear length, ear diameter, ear weight of 100 kernels and kernel yield would be possible in the F_2 or F_3 generation.

Agr. 623 Shahidullah, M.M. Yousaf and A.D. Chowdhury. 1971. **Combining ability for yield and its components in maize single crosses.** *Nucleus. 8 (3): 127-130.*

The relative estimates of general and specific combining ability effects and their variances for yield and its components were obtained for a set of 15 F_1 crosses possible among six inbred lines. Both the general and specific combining ability effects were found to contribute to grain yield and its components except for the 100 kernel weight-in which only specific effects were important. The combining ability for yield was closely associated with the combining ability for the number of ears per plant and kernels per row, which indicated the usefulness of the component analysis approach to classifying parent lines for hybrid performance.

Agr. 624 Eunus. M. and M. A. Razzaque. 1972. **Effect of nitrogen, phosphorus and potassium on the yield of maize (*Zea mays* L. var flint).** *Rep. Dep. Agron. Bangladesh Agr. Univ. (MS).*

An experiment with a local flint type of maize with 4 levels of nitrogen at the rate of N_0 (control), $N_{89.80}$, $N_{134.76}$ and $N_{179.63}$ kg/ha from urea; 3 levels of phosphorus at the rate of P_0 (control), $P_{44.90}$ and $P_{89.80}$ kg/ha from triple super phosphate as well as 3 levels of potassium at

the rate K_0 (control) $K_{44.90}$ and $K_{89.80}$ kg/ha from muriate of potash was carried out at the Farm of Bangladesh Agricultural University, Mymensingh during the period from June through Sept. 1972. Treatment combination $N_{1.79.63} P_{89.80} K_{89.80}$ gave the maximum grain yield (1878.92 kg/ha) and which was significantly superior to the treatment combinations of $N_0 P_{89.80} K_0$, $N_0 P_{44.94} K_{84.80}$, $N_0 P_{44.90} K_{44.90}$ and $N_0 P_0 K_0$ and identical to the rest of the character. Treatment combination $N_0 P_0 K_0$ gave the minimum grain yield (400.36 kg/ha) and which was significantly inferior to the $N_{179.63} P_{89.80} K_{89.80}$, $N_{134.76} P_{44.90} K_{44.90}$, $N_{89.80} P_{44.99} K_{89.80}$ and $N_{134.76} P_{89.80}$ and identical to the rest of the treatment combination under study for the character.

Sorghum

Agr. 625 Idris, M., F.I. Fisher and G. W. Trogon. 1970. **Correlation of grain sorghum yield to nitrogen as measured by various soil test methods.** *Pakistan J. Soil Sci.* 6 (2):10-16.

A correlation study between percent relative yield of grain sorghum and three nitrogen soil test method was conducted using soil samples and yield response data of Texas High Plain and Backland Prairie areas. The three soil test methods were nitrate nitrogen produced after 10 days of incubation at 35°C, 0.5N $NH_4 HCO_3$ extractable humic acid and organic matter. Nitrate nitrogen and humic acid gave a relatively better correlation coefficient with percent relative yield and both were significant at 5% level. The correlation coefficient between percent relative yield and organic matter was remarkably low and nonsignificant. A negative correlation was obtained between nitrifiable nitrogen and organic matter. The correlation coefficient between humic acid and organic matter, however, was comparatively high and significant at 1% level. The soil type had definite effect on correlation coefficient. Nitrifiable nitrogen correlated better with yield on soils from High Plain while the yields of Black land Prairic soils correlated well with humic acid.

Wheat

Agr. 626 Rahman, M.M. and K. M. Badruddoza. 1965. **The study on the effect of lodging on the performance of wheat.** *Proc. 17th Pakistan. Sci. Conf. Abs.* A-13-14.

Investigations on the effect of lodging upon the performance of wheat were carried out with two varieties IP-125 and Jamali and following treatments : (a) normal stand, (b) complete lodging at heading, (c) complete lodging 10 days after heading, (d) complete lodging 20 days after heading, and (e) control for which the plants were kept erect with the support. Lodging was made artificially. Studies were based on kernel number per spike, 1000-kernel weight, grain yield per plot and protein content of kernel. The results indicated that all types of lodging significantly reduced the number of kernels per spike and the 1000-kernel weight in both varieties of wheat compared to the control. In all cases, the reduction was maximum due to lodging at heading. The amount of reduction became gradually less at lodging after 10 days and 20 days of heading. Similar trend of effect of lodging on grain yield was also observed. The loss in yield was so heavy that about 58% and 60% reduction in IP-125 and Jamali respectively were noticed as a result of lodging induced at the time of heading. The loss in

yield due to lodging at other successive stages of plant growth was, however, progressively lesser. Results also showed that lodging at different stages of plant life produced a considerable increase in protein content of kernels. The maximum increase was noted under lodging at heading. At other stages, recorded a progressive decrease in protein content; the minimum was with control.

Agr. 627 De. H. N., N. M. Khan. A. Islam and Y. Mollah. 1966. **Studies on wheat and wheat products, part I. effect of steaming of wheat on its storage characteristics and on its nutritional characters in decreasing the fat deposit and increasing the protein synthesis in liver.** *Sci. Res.* 3 (2): 127-139.

Local wheat was steam-heated for 10, 20 and 30 minutes showed complete absence of larvae or adult insect, *Tribolium castecewn* even after storage for one year. The amylase was also completely inactivated by retarded. Feeding experiments showed decrease of the fat and increase of the protein-N contents due to replacement of ordinary wheat by 30 minutes steam-heated one. Further decrease of the fat and increase of protein-N content of liver is noted when the above steam-heated wheat is mixed with parboiled rice in the ratio of 1: 1. More improvement of the nutritional qualities of steamed wheat as judged by the liver fat and protein-N distribution in a reverse manner occurs when the vermicelli prepared from cooked parboiled rice and steamed wheat flour is fed to the rate.

Agr. 628 Ullah, M. B. 1966. **A comparative study on the effect of broadcast and row application of phosphate on the yield of wheat.** *M. Sc. (Ag.) Thesis. East Pakistan Agr. Univ. (MS).* 73 p.

An experiment was conducted at the East Pakistan Agricultural Institute Farm to study the comparative effect of broadcast and row application of phosphate at 4 levels on wheat crops. Results revealed that the yield was increased with increasing rates of phosphate application. It was further observed that the yield of wheat increased significantly with levels of phosphate and both the methods of application. The yield was satisfactorily higher with lower doses in row placement and higher doses with broadcast placement.

Agr. 629 Abedin. M.J. 1967. **A study on the response of the different Mexican wheat varieties and one local variety with different levels of nitrogen and phosphatic fertilizers in response to one level of potassic fertilizer.** *M. Sc. (Ag.) Thesis. East Pakistan Agr. Univ. (MS).* 67 p.

An experiment was conducted at the East Pakistan Agricultural Institute Farm, during the year 1966-67 on the three varieties in response to different doses of nitrogen and phosphorus. The application of nitrogen and phosphate had also been found effective in increasing the density of the spikes, length of the spikes and number of kernels/spike and phosphorus increased the grain yield significantly. The results were highest with Mexican wheat when the field was supplied with 80 lbs. N and 80 lbs. P₅₀/acre.

Agr. 630 Bhuiyan N. I. 1970. **Influence of parental density on the emergence of adult beetles, *Tribolium confusum* Duval and *Tribolium castaneum* Hbst. In wheat flour and rice bran.** *Res. Rep. Evaluation and Coordination Committee. Directorate Agr. Govt. East Pakistan.* 2 p.

The variation on the emergence of adult beetles were observed in F₁ generation for six parent densities. The experiments were set with 5 gms of wheat flour or rice bran in petridishes of constant size at room temperature of $30^{\circ}\text{C} \pm 2.3$ and R.H. $74.3\% \pm 5.8$. Parent adults were released in pairs from the stock cultures. After 20 days, the eggs with food media were removed and left for hatching. The life-cycle of *T. Castaneum* Hbst. was shorter than that of *T. Confusum* du Val. The emergence of progeny adults per female-day was much influenced by the density of parent population. Maximum number of progeny per female day (larvae/adults) were observed at an intermediate density and above it the number decreased. The drastic reduction in the number of progeny resulted from overpopulated parent density and the relation was practically a liner function of the parent density. The relation between parent density and the rate of reproduction in both species of flour beetle followed a sort of rectangular hyperbola ($Y = \frac{Z}{X + b}$, Farr's demographic formula).

Agr. 631 Saha, N.K. and S.M. Hasanuzzaman. 1970. **A comparative study of the yield components of two Mexican short statured and one standard wheat variety IP-52.** *M. Sc. (Ag.) Thesis. East Pakistan Agr. Univ.* 106 p.

The Mexican wheat varieties produced more yield per acre than the local improved variety IP-52. To find out the reason, the yield contributing characters of two Mexican wheat varieties. Payamo-62 and Sonora-64 were studied for comparison with those of the local standard variety IP-52 under 0, 30 and 60 levels of N and P₂O₅ keeping the level of K₂O fixed at 40 lbs. per acre. The Mexican wheat varieties had shorter plant height and produced more number of fertile tillers per plant than the local variety. They also had longer and heavier spikes with bolder grains per spike. Moreover, the Mexican varieties produced lesser number of sterile grains than the local variety. Because of shorter plant height and higher yield per plant they had narrower grain straw ration and finally all the yield contributing components interacted to produce higher per acre yield.

Agr. 632 Mian, A.L. and A.U. Sarker. 1971. **Effect of time and method of planting on the yield of norteno-67 cultivar of wheat.** *M. Sc. (Ag.) Thesis. East Pakistan Agr. Univ. (MS).*

Norteno-67 cultivar of wheat was sown broadcast and in 10-inch apart rows on 10, 20 and 30 November and 10 December 1970. The experiment was laid out in a split-plot design with time of planting in the main plots and the method of planting in the unit plots. The time of planting significantly influenced the yield and yield contributing characters studied except the 1000-grain weight. The crop planted on 30th November gave the highest yield. The method of planting did not show any significant influence on the yield of wheat.

FODDER CROPS

Alfalfa

Agr. 633 Momin, A. and S. M. Roble. 1972. **Studies on alfalfa mosaic virus.** Ph. D. Thesis. Univ. Exeter, England (MS). 150 p.

Successful inoculation of red clover (*Trifolium pratense* L.) varieties with alfalfa mosaic virus (AMV) was made with great difficulty only by pre-disposing them to darkness for 72 hours. AMV was present in leaves, stems, roots and anthers of systemically infected red clover plants. The concentration of AMV in broad bean was the highest in the apical meristem up to 25 days after inoculation and between 25 and 32 days, the virus became evenly distributed throughout the entire plant. AMV was not found to be seed-transmission of AMV did not occur in red clover. A potent inhibitor of AMV infection in French bean was demonstrated in thirteen varieties in five species viz. red clover, pepper, tomato, pea and field bean investigated. The percentage of inhibition ranged from 93.5 to 100 in different varieties. The inhibitor in leaves, stems and root was less potent than that in the whole blossoms. The inhibitory substance present in red clover and pepper was thermos table while that in broad bean was thermolabile.

Paragrass

Agr. 634 Ali, M. I. and D. H. Khan 1968. **Yield and chemical composition of pargrass grown under different fertility conditions.** M. Sc. (Ag.) Thesis. East Pakistan Agr. Univ. (MS). 171 p.

A fertilizer trial on paragrass was carried out in the farm land of Agricultural University, Mymensingh. There were three rates of nitrogen, three rates of phosphorus and two rates of potash. The results show that fertilizer-N progressively increased yields of grass at different stages of cutting. The P-application progressively increased the yield at the first cutting, the rate of increase being much less than due to N-application. P did not show any significant increase of yield at the second and third cutting stages. Potassium treatment did not show any significant effect on yield. However, significant PK interaction was observed at the first cutting stage. The maximum yield was recorded due to the application of 60 lbs. N, 30 lbs. P₂O₅ and 30 lbs. K₂O/acre at the first cutting stage. The cation-anion relationships were studied at the first and second stages of cutting.

Agr. 635 Bhuiya, Z. H., M. S. Islam and M. A. Sattar. 1973. **The yield response of paragrass (*Brachiaria mutica*) to N, P and K fertilizers.** *Bangladesh J. Agr. Sci.* 2 (1). (In Press).

A fertilizer trial on paragrass was carried out in the Noncalcareous Dark Grey Floodplain Soil of Bangladesh Agricultural University Farm, Mymensingh with three rates of nitrogen, three rates of phosphorus and two rates of potassium. The application of nitrogen and phosphorus progressively and significantly increased the grass yield at all 4 stages of cutting. The potassium application produced a little effect on the yield.

Pangola Grass

Agr. 636 Islam, M. S. and M. A. Sattar. 1973. **The yield response of pangola grass to N, P, and K fertilizers.** *Bangladesh J. Agr. Sci.* 2 (1). (In Press).

A fertilizer trial on Pangola grass (*Digistaria decembens*) was carried out in the Bangladesh Agricultural University Farm, Mymensingh with three rates of nitrogen, three rates of phosphorus and two rates of potassium. Four cuttings of the grass were taken at an interval of 60, 132, 198 and 262 days. The application of nitrogen progressively and significantly increased the grass yield at all stages of cuttings. A significant increase of yield was observed due to the application of phosphorus up to third cutting stage. The potassium application produced a little effect on the yield.

Rye-Grass

Agr. 637 Huq, M. and A. H. Cornfield. 1966. **Effect of treating a soil, at three pH levels, with different composts on nutrient uptake by rye-grass in pot culture tests.** *Pakistan J. Soil Sci.* 2 (2): 31-36.

Five kinds of composts tried in Silwood soil of 3 pH levels gave the dry matter yield and supplied N, P and K to the rye-grass in the following decreasing order: Grass compost, Sludge compost, Blood compost, Nitrochalk compost, Control, Poor compost. The poor compost with its wide C/N ratio of 32 gave less dry matter yield and less uptake of N, P and K than the control treatment due to its immobilizing effect of available soil nutrients. The nitro chalk compost with its C/N ratio of 28 gave better performance than poor compost but poorer than grass, sludge and blood composts. The better performance of latter three composts is attributed to their narrow C/N ratios of 12, 16 and 20 respectively and also to their higher nutrient status. Grass and sludge composts did better in soil pH of 5.2 and 6.2 and blood compost became increasingly more effective with increasing pH of 7.2.

Horticultural crops

Fruits

Banana

Agar. 638 Chowdhury, A. R. 1961. **Agricultural Research Achievements in East Pakistan.** Govt. Press. Dacca.

A varietal trial designed statistically was conducted with six banana varieties, namely Amritsagar, Champa, Kanaiphashi, Safri, Agniswar and Dudhshar. Amritsagar was found to be the best of all in respect of the production of fruit per plant excluding peduncle, the time taken from planting to harvest as well as the size and weight of the individual fruit. The Safri, the other best variety in respect of taste was rather a medium yielding, the second best yielding variety being Champa which was found to excel all other in respect of number of fingers. The Agniswar and Dudhshar proved to be the poorest in almost all counts and were thus rejected outright. This experiment confirmed the position of Amritsagar as the best commercial variety.

Agar. 639. Ahmed, A. and M. Z. Alam. 1964. **Notes on the biology of banana leaf and fruit beetle, *No Dostoma VIRIDIPENNIS* mots.** Rev. Res. Div. Entomol.

Nodostima viridipennis Mots. (Emmelpidae: Coleoptera) is a serious pest of Banana leaf and young fruits in East Pakistan. Some aspects on its biology have been studied during the period from 1960 to 1962. The feeding habits, nature of damage on young leaf and fruits have been described. The different stages of the pest have been enumerated and seasonal abundance has been stated.

Agar. 640 De, H. N., O. Faruque and M. Suleiman. 1966. **Investigations on storage of fruits and vegetables. Part I. storage of green mature amritsagar banana (Gros Michel variety) by application of improved technique of restricted ventilation.** Sci. Res. 3 (1): 52-69.

An improved technique for storage of banana (Amritsagar variety) under controlled atmosphere i.e. under restricted ventilation has been devised and by its application the fruit in green and mature stage can be stored for a period of over three weeks in this humid tropical temperature above 80°C and having the relative humidity above 80 percent. This offers the possibility for home storage and transport of the fruit in fresh condition, thus preventing the spoilage due to over ripening during transport by ordinary routes. The report also submits the comparative storage life of the banana kept in refrigerated temperature and in ordinary temperature under restricted ventilation. The changes of the chemical constituents like ascorbic acid, total and reducing sugars and the titratable acidity due to storage under different conditions of restricted ventilation with lime and caustic potash scrubber and without any scrubber and under storage in refrigerated temperature and their comparison with the

contents of the fruits ripened in ordinary manner, have been discussed in the light of the respiratory changes under the above conditions of storage.

Agr. 641 Ahmed, K. U. 1967. **Fruit characteristics of the banana varieties of East Pakistan.** *Pakistan J. Biol. Agr. Sci.* 10 (1): 31-41.

There are as many as 19 edible varieties of banana in East Pakistan. Of these, 6 varieties; viz. Amritsagar, Safri, Agniswar, Dudshar, Singapuri and Madrasi are entirely seedless superior table bananas. There are 4 table bananas that sometimes contain a negligible number of seeds in them. They are Champa, Chini Champa, Kabri and Chandani Kabri. The seeded bananas comprise Botur Aita, Goma, Niyaila and Shangi Aita. The variety Jap-Kadali, though resembles the seeded bananas in taste, texture and aroma is almost seedless. The cooking varieties, popularly termed as plantains, consist of Anaji Kala, Bherardog, Choalpoush and Kach Kala.

Agr. 642 Ahmad, K. U. and A. Mannan. 1970. **Effect of size of pit and spacing on the performance of amritsagar banana.** *Punjab Fruit J.* 32: 110-111.

To determine economic spacing and pit size, an experiment was laid out with Amritsagar banana at Dacca Farm in a split-lot design with three spacing, namely 4 ft. square, 6 ft. square and 8 ft. square under three pit-sizes, such as, 1 ft. cube, 1½ ft. cube and 2 ft. cube. The height of the pseudostem increased with the decrease of the spacing. Neither the spacing nor the pit sizes nor their interactions could influence the number of leaves per plant. Pit size influenced the number of hands, the latter increasing gradually with the increase of pit size. The wider the spacing, the higher was the weight of hand and the number of suckers. The number of suckers increased with the increase of pit size. Spacing was directly related to yield per plot. The effect of spacing and pit size on the period from planting to flowering and from flowering to harvesting, and on income were also discussed.

Agr. 643 Ahmad, K. U. and M. B. Ali. 1970 **A comparative study on the performance of amritsagar and Basral bananas.** *Hort. Res. Notes. No. 12, Div. Hort. ARI. Dacca* 6 p.

There is a need for increasing per acre yield of banana as much as possible. Variety is the biggest single factor in respect of yield. Therefore, a dwarf, exotic, high yielding banana variety named Basari was put to test against Amritsagar, the best local variety at Dacca Farm. They were planted in a randomized block design with 25 suckers of each variety in each plot that were replicated three times, the plants having been spaced 6 feet square. Amritsagar was a much larger plant than Basrai in terms of plant height, petiole length, and lamina length and lamina width. Amritsagar produced large number of suckers, too. But considering Basrais short stature it was found to be much stouter a plant having an identical base girth and a rather bigger top-girth. Although Basrai took a somewhat larger time to produce ripe fruit, it gave bunches of much larger size, thus yielding as much as 573.07 maunds per acre as against 398.91 maunds yielded by Amritsagar.

Agr. 644 Khan, M. A. A. and M. M. A. F. Jalal. 1970. **Biochemical studies in the developing and ripening banana.** *Pakistan J. Bot.* 2 (2): 25-30.

In developing and ripening banana fruits the dry matter was found to increase gradually with age followed by a small decrease at the ripening stage. The total carbon content of banana followed a similar curve. The starch content increased gradually from early stage to full maturity, while there was hardly any change in sugar contents during this period. During ripening starch content decreased with a concomitant rise in the sugar content. Glucose and sucrose were found to be the major sugars in young and ripe banana respectively.

Agr. 645 Ahmad, K. U., M. A. Matin and M. A. Quasem. 1973. **Performance of some banana varieties when in damp land.** *Bangladesh Hort. J* (2).

Banana needs and absolutely well-drained soil for its cultivation. But there are many places in Bangladesh, particularly in the hilly areas where many so-called high lands are rather dampy even during dry parts of the year. In order to know whether such lands could be devoted to the raising of banana, a study was undertaken at Hathazari on a piece of land which remained damp even in the winter season. The varieties put to trial were Amritsagar, Safri, Champa, Singapuri and Kabri. Results indicated that banana could be grown in damp soils, but the time taken by plants to give ripe fruits would be rather long. The varieties took, on the average, 561-67 days to complete their life cycle. The variety Champa which yielded the heaviest bunches, took the shortest time, Kabri gave the second biggest bunches, though taking a long time in the process. Singapuri had the third place in respect of yield, but took the longest time. Safri took up the fourth place in respect of yield and took the second longest time to fruit. Amritsagar performed the worst in respect of yield, though, taking nearly the shortest time. It was concluded that if banana was to be grown at all in a damp soil, the variety should be either Champa or Kabri. The more sophisticated varieties should always be avoided for such enterprises.

Agr. 646 Ahmed, K. U. and M. B. Ali. 1973. **Performance of Amritsagar and Basra Bananas when grown as perennial crops.** *Bangladesh Hort. J* (1): 1-8.

A study was undertaken at Dacca to test the performance of the exotic Basra banana when compared with indigenous Amritsagar, as well as to explore the possibilities of growing them as perennial crops. Basrai produced over 50 percent more banana per acre per plant than Amritsagar. All the ratoon crops yield less banana than the first crops, but yield was not so low as to discard the idea of perennial cropping. Basrai has been quite successful as perennial crop up to the fifth year while Amritsagar's performance has not been discouraging. With an increase in the manurial schedule, it might be possible to get good crops for some more years. The number of fingers per bunch given by Basrai was double of that given by Amritsagar. While from the point of view of taste, flavor and color, Amritsagar was superior to Basrai, the

former was found to be quite susceptible to cyclones or even strong winds, and the latter was nearly immune. Considering very high yield and cyclone resistant the exotic Basra banana was recommended for wide-scale cultivation in Bangladesh. The perennial cropping pattern for banana for at least five years was also recommended.

Betelnut

Agr. 647. Hyder, M. O. and K. U. Ahmed. 1967. **A study on the effects of duration of storage and depth of sowing on the germination of *Areca catechu* Linn. Seeds and growth of their seedlings.** *M. Sc. (Ag.) Thesis. East Pakistan Agr. Univ. (MS). 101 p.*

The experiment was undertaken to study the effect of duration of storage and depth of sowing on the germination of *Areca Catechu* Linn. Seeds and growth and development of their seedlings in field conditions only. Studies were made on number of seeds germinated, number of days taken to germinate the betelnut seeds, number of days taken to attain 8 cm height from the date of sowing and from the date of germination, height of seedlings, diameter of pseudostem, length of leaf, number of open leaves produced, number of roots produced, weight of seedlings, weight of roots, and number of plants survived. The result indicated that maximum number of betelnut seeds germinated when freshly harvested seeds were sown within 24 hours of harvesting at a depth of half an inch under soil. Bitternut seeds took more number of days to germinate when sown within 80 days of harvesting, whereas seeds sown beyond 80 days of storage took less number of days for germination. As regards the characters based on external morphology, the deeper the depth of sowing and those of shorter duration of storage were the best. Maximum number of seedlings survived when the seeds were sown at a depth of half an inch under the soil and without any duration of storage.

Agr. 648 Razzaque, A. and K. U. Ahmad. 1972. **Effect of the use of sand in the soil and the depth of sowing on the germination and growth of Betelnut seedlings.** *M. Sc. (Ag.) Thesis. Bangladesh Agr. Univ. (MS). 103 p.*

The experiment was conducted with 5 mixtures of sand and soil such as S₁ (100% soil and 0% sand), S₂ (75% soil and 25% sand), S₃ (50% soil and 50% sand), S₄ (25% soil and 75% sand), and S₅ (0% soil and 100% sand), and 4 depths of the placement of seeds, such as D₁ (perianth-le-vel), D₂ (0 inch), D₃ (½ inch), and D₄ (1 inch), in order to find out their effects on the percentage of germination and subsequent growth of betelnut. In summary, it has been stated that best possible result, as far as this experiment was concerned, had been attained from the placement of the seed at the depth of 1 inch in the bed having garden soil only, the use of sand having no favourable effect on the overall performance of the betelnut seed.

Citrus

Agr. 649 Alam, M. Z. 1962. **A list of insect and mite pests on citrus crops in East Pakistan.** *Annu. Rep. Div. Entomol.*

During the survey of different crop pests, eighteen different insects and one mite pest have so far been recorded in East Pakistan. They are listed below with their status on different Citrus crops.

Agr. 650 Alam, M. Z. and M. A. Satter. 1964. **on the biology of citrus yellow scale, *Aonidiella citrina* Coq in East Pakistan.** *Rev. Res. Div. Entomol.*

The Citrus yellow scale, *Aonidiella citrina* Coquillett (Coccidae: Hemiptera) is an important pest of citrus plants in East Pakistan. During 1960-61 its biological studies were undertaken. The distribution of the pest has been enumerated and the food plants are recorded. The different stages along with their external morphological characters have been described. The seasonal history has been worked out. The natural enemies and their influence on the pest species have been stated.

Agr. 651 Alam, M. Z. and M. L. Hossain. 1964. **on the biology of citrus black fly, *Aleurocanthus woglumi* ashby in East Pakistan.** *Rev. Res. Div. Entomol.*

The citrus black-fly, *Aleurocanthus woglumi* Ashby (Aleurodidae : Hemiptera) is a serious pest of citrus plants in East Pakistan. During 1962 and 1963 different aspects of its biological studies were conducted. Feeding habits, nature of injury and extent of damage have been worked out. The different stages and their external morphology have been described. Seasonal history has been enumerated. Natural enemies and their influence on the pest species have been stated.

Agr. 652 Alam, M. Z. and A. Hoque. 1966. **Studies on the biology of citrus leaf miner, *Phyllocnistis citrella* Stainton (Gracilaridae: lepidoptera) in East Pakistan.** *Annu. Rep. Div. Entomol.*

The citrus leaf miner, *Phyllocnistis citrella* Stainton is one of the most serious pest of citrus in East Pakistan. The pest is cosmopolitan in distribution in the citrus growing countries of the world. The caterpillar mines the leaf forming a semi-transparent zigzag tunnel on both surface of the young leaves. The caterpillar feeds on a part of the young leaves. The caterpillar feeds on part of the chlorophyll layer causing stunted growth and ultimately curling the leaf. Researches have been carried out on the biology of the pest covering distribution, food plants, nature and extent of injury, bionomics of all stages, seasonal history and natural enemies.

Among all the citrus species pomelo has been found to be the most susceptible to this insect attack. The life cycle of the insect completes from 13 to 30 days having the egg stage-1-6 days, larval stage-4-11 days, pupal stage-8-12 days and adult longevity 1-2 days.

Agr. 653 Alam, M. Z. 1966. **Studies on the lemon butterflies.** *Annu. Rep. Div. Entomol.*

Two species of lemon butterflies, *Papilio demoleus* L. and *P. polytes* L. have been indicated as serious pests feeding on lemon and lime leaves in different localities of East Pakistan where-ever they are grown. The feeding habits, nature of injury have been enumerated. The brief life histories have been described. Control measures suggested.

Agr. 654. Haque. A. and S. H. Hazarika. 1966. **Studies on the biology of citrus leaf-miner, *Phyllocnistis citrella* Stainon (Gracilaridae: lepidoptera) in East Pakistan.** *M. Sc. (Ag.) Thesis. East Pakistan Agr. Univ. (MS). 62 p.*

Life cycle of *P. citrella* was completed on an average of 15.4 and 28.2 days respectively in warm (i.e. April to October) and cold days (i. e. November to March). Each developmental stage of the pest also lengthened during cold days. There were three larval instars, of which third one had the longest stadium. Pupa was obtect and the pupal period was longest of all developmental periods. Before emergence, pupa had cut its way from the pupil cell with the help of its cephalic cocoon cutter. Adults were short lived. Only larvae pest were responsible for causing damage to the leaves by mining through its epidermis. They preferred to feed on both surface of tender and newly sprouting leaves. The intensity of infestation was found higher on pomelo and Lemon and Orange by this pest. Highest infestation of the pest occurred in July, August and October on Lemon, Orange and Pomelo respectively.

Agr. 655 Haque, M.A. and K. U. Ahmad. 1966. **Propagation of some citrus species by stem cuttings with growth regulators.** *Pakistan J. Biol. Agr. Sci. 9 (2): 33-40.*

The work embodied in this paper was carried out to evaluate the extent of success in the propagation of three citrus plants, *C. aurantifolia*, and *C. lemon* and *C. grandis* by stem-cuttings with the use of their root-inducing chemicals, namely, indole acetic acid, indolebutyric acid and naphthalene acetic acid. It was found that none of the *Citrus lemon* and *Citrus grandis* cuttings was successful in rooting in response to either treatment of control. There was successful rooting only in case of *Citrus lemon* under both treatment and control. 200 ppm. of IAA and IBA and 100 ppm. NAA produced highest percentage (71.9) of successful plants while the success was only 40.6% at control. 200 ppm. of NAA gave the lowest success.

Agr. 656 Mahmood, A. M. and A. H. M. Faruque. 1970. **Rooting performances of some citrus species from stem cuttings.** *Nucleus. 7 (1-2): 52-58.*

Juvenile and mature stem cuttings of 'Jelaichi limn', seedless lemon, pink fleshed pomelo, and 'kaghazi lemon' were grown in sand media to evaluate the effect of indole butyric acid on

rooting. Stem cuttings of 'elicit lemon, and seedless lemon rooted successfully while pommel was a poor rooter and 'Ghazi lemon', totally failed to root. Juvenile cuttings had better rooting performances than the mature cuttings.

Coconut

Agar. 657 Qudrat-i-Khuda, M. S. Hedayetullah, A. Y. Sikder, B. D. Mukherjee and N. A. Khan. 1961. **Production and utilization of coconut in the coastal belt of Pakistan.** *Proc. 13th Pakistan Sci. Conf. Abs. A-83.*

The advantages and disadvantages of the coconut growing areas of East Pakistan have been discussed with regard to; (a) insurance in plant growth and crop yield, (b) natural, pesticidal and microbial devastation and wastage with emphasis on generation (c) expansion and intensification of cultivation, (d) improvements in soil and environments through research and import, improved varieties of plants through research and import, (g) human and economic conditions, etc. The general statistics on the distribution of coconuts, products and waste residues, have been attempted through various sources. The present trends in the country emphasising the procedures for preparation of edible oil are taken into consideration for suggesting further improvements or for radically modifying them. The proper impetus is also given to the mechanical and engineering aspects of the problems. Finally, the chemical and nutritional features involved in coconut products and waste residues that can import additional boost to the coconut economy and industrial development, have been dealt with in details. The comparative studies have also been made with the data available in all the above phases of coconut in other countries like Philippine, Ceylon, Pacific islands, as well as the scientifically advanced countries America in particular. Suggestions have then been offered in introducing innovations, improvements and better know-how in various facets of the problem including education of the illiterate mass of people involved.

Agr. 658 Ahmad, K. U. 1965. **The relative amounts of the various components of the coconuts of East Pakistan.** *Agr. Pakistan 16 (2).*

A study was undertaken to find out the relative amounts of various components of coconuts of East Pakistan when compared with those of Ceylon as well as those of such coconuts as where analyzed or recorded by Norris, as early worker on coconut. The study involved 10 freshly harvested ripe coconuts collected from each of four districts such as Barisal, Khulna, Jessore and Noakhali and randomly selected Ceylonese coconuts obtained from a consignment of coconut seeds that were received from Ceylon in Dec. 1963. It was revealed from the study that the average whole weight of the coconuts of East Pakistan, which was 36.64 ounces, compared very favourably with the average coconuts of the other parts of the world. Selected coconuts of East Pakistan and those of Ceylon were identical in their weight, weighing 45.92 ounces and 46.14 ounces respectively. When water, the highly variable component part was disregarded, it was found that East Pakistan coconuts were slightly more

husky, slightly more shelly and had fairly identical proportion of kernel (about 38%), when compared with average coconuts studied by Norris and selected coconuts of Ceylon.

Agr. 659 Alam. M. Z. and S. Alam. 1965. **Notes on the biological study on coconut caterpillar, *Nephantis seriopa* Meyer (Xylorictidae: Lepidoptera) in East Pakistan.** *Scientist*. 8 (3).

Nephantis serinopa M., commonly known as coconut caterpillar, is an important pest of coconut leaf in all coconut growing countries of South East Asia. The pest causes considerable damage to coconut leaves in East Pakistan. During 1960-65 some aspects of its biology were studied. The distribution of the insect has been enumerated and the food plants are listed. Feeding habits, nature and extent of injury have been enumerated. The different stages with their external morphology have been described. Seasonal abundance has been stated. Natural enemies have been listed.

Agr. 660 Alam, M. Z. and S. Alam. 1967. **Parasites recorded on coconut caterpillar.** *Aunu. Rep. Div. Entomol.*

In course of the biological studies of coconut caterpillar, *Nephantis serinopa* Meyer, two species of larval parasite, *Elasmus nephatidis* Gahan (Chalcididae, Hymenoptera) have been recorded.

Agr. 661 Ahmad K. U. 1968. **Results of some nursery technique experiments with coconut.** *Pakistan J. Biol. Agr. Sci.* 11 (1).

Experiments were conducted to help improve the nursery techniques of coconut and growing seedlings of superior quality coconut with a greater amount of success. Experiments included the determination of proper spacing of seeds in the nursery bed. Coconut seeds germinated slightly better when they were placed outside the nursery bed. Keeping of the seeds in heaps covered with straw gave the best germination percentage. When the germination of seeds as well as their subsequent development into seedlings were taken into consideration it was found advisable to place the seed directly into the nursery bed. Coconut seeds germinated to various extent in all months of the year. The lowest percentage of germination of 60.05 was found for the planting of seeds in March and the highest percentage of 78.00 for the planting of September. Spacing did not seem to have any significant effect on germination of seed of coconut.

Agr. 662 Ahmed. K.U. and M. Tabibullah. 1972. **Effect of shading, mulching and potassium on the germination and growth of coconut seedlings.** *Bangladesh Agr. Res. Inst., Dacca-15. (MS).*

Shading the seed-bed, mulching of the soil on the application of potassium in the soil did not have any effect on the germination of coconut seedlings. Mulching effected the length of

seedling very significantly. Shading too had profound effect on the height and girth of the seedlings. However, shaded plants grew in height at the cost of the girth. It was concluded that shading did not have any favourable effect on the overall growth of coconut seedling. However, mulching with water hyacinth on straw may be resorted to aiming at obtaining their good growth.

Agr. 663 Tabiullah, M. 1972. **Biological studies on the coconut scale, *Aspidiotus destructor* Singoret (Diaspididae Homoptera) using different coconut varieties and a technique for mass rearing the insect.** *M. Sc. Thesis. Univ. Philippines. (MS). 68 p.*

The biology and host preference of the coconut scale were studied under green-house and field conditions on three common coconut types (1) Laura, variety Typica, (2) Tambulilid, variety Javanica and Cocomino, variety Nava. The life cycles and other biological aspects of the scale on cocomino cocount were almost identical with those in Lagura type. But the insect exhibited significantly smaller sizes and higher mortality on coconut, indicating a resistance in this coconut. The scale population under Los Banos condition was quite high from May to July and again from November to January. The scale was also found infesting fruits of *Citrus grandis* Osb. *Cucurbita maxima* Duch, *Virchia meritti* Becc, and leaves of *Areca catechu* Linn., *Pasidium guajava* Linn. etc. The matured fruit of *C. maxima* Duch was found to be a suitable host for the mass rearing of the scale in the insectary.

Guava

Agr. 664 Islam, M. M. I. and M. A. Siddique. 1973. **A study on the induction of parthenocarpic guava by gibberellic acid.** *Bangladesh Hort. 1 (1): 31-36.*

Fully developed flower buds were emasculated and dipped in aqueous solutions of potassium salts of GA at 0, 50, 100, 150, 200, 250 and 300 ppm concentrations. A control treatment (with out emasculation or CA treatment) was also included for study. None of the emasculated flowers treated with 0 ppm GA set fruit. CA at 150 ppm set retained the maximum number of fruits followed by GA at 200, 150, 300, 100 ppm and control in descending order. Parthenocarpic fruits were larger in size and weight than the normal fruits. Parthenocarpic fruits were absolutely seedless with a characteristic central cavity and with ridging at the upper surface. The amount of ascorbic acid and total soluble solids were significantly higher in the parthenocarpic fruits than those of the normal fruits.

Agr 665 Ahmad, K. U. and A. Quasem. 1969. **A trial for the propagation of jack-fruit by vegetative means.** *Pakistan J. Biol. Agr. Sci. 12 (1) : 40-44.*

It has been possible to propagate jack-fruit through vegetative means. All the three methods, viz. contact grafting, patch-budding, and shield-budding, that were tried, were possible, though with varying amounts of success. While the success for contact grafting was 35 percent, the patch-budding done on the one-year-old stock plants attained success to the

extent of 37 percent and 68.3 percent respectively. The shield-budding failed altogether when done on one-year-old stocks, but was successful to the extent when done on two-year-old stocks. The month of April and the early part of May appear to be best time in so far as the budding practice is concerned. Further studies with changes in the techniques of grafting and budding should be able to find out methods for attaining a greater degree of success for propagating jack-fruit through vegetative means.

Jujube

Agr. 666 Husain, A. 1973. **Propagation of jujube (*Zizyphus jujube*) by patch budding.** *Bangladesh Hort. 1 (1): 48-50.*

A possible method for the improvement of jujube growing industry in Bangladesh through top working has been put forward in this paper. Patch budding, a widely and successfully used method of vegetative propagation was observed to be the most convenient for top working in jujube. The procedure of patch budding as per the experience of the author with the propagation of jujube during the period 1967 to 1970 has also been described.

Litchi

Agr. 667 Alam, M. Z. and M. A. Wadud. 1963. **On the biology of litchi mite, *Aceria litchi* Keifer (Eriophyidae, Acarina) in East Pakistan.** *Pakistan J. Sci. 15 (5).*

The litchi mite, *Aceria litchi* Keifer is one of the most important pests of fruit trees, attacking the litchi leaves in East Pakistan. During 1960-61 different aspects of its biology have been studied. The distribution of pest has been enumerated. Feeding habits, nature and extent of damage have been indicated. The different stages with their external morphological characters have been described. Seasonal cycles have been enumerated. Natural enemies and their influence on the pest have been stated.

Agr. 668 Sharfuddin, A. F. M. and A. Husain. 1973. **Effect of growth regulators, rooting and wrapping materials on the success of air layering in litchi.** *Bangladesh Hort. 1 (2): 45-51.*

Air layering with the help of NAA and IBA at 500 ppm concentration with three combinations of rooting and wrapping materials were practiced in 'China No. 3' variety of litchi. The three combinations of rooting and wrapping materials were, (i) sawdust wrapped with plastic film, (ii) mixture of soil and cow-dung wrapped with plastic film and (iii) mixture of soil and cow-dung wrapped with gunny cloth. Rooting percentage, root initiation, root length and number of roots were markedly increased by the application of NAA or IBA which had significantly different effect from the control treatment. The best rooting performances were obtained from the combination of NAA or IBA and sawdust wrapped with plastic film.

Mango

Agr. 669 Islam, M. A. 1961. **Fertilizer use in East Pakistan.** *Paramount Press, 9, Hathkola Rd. Dacca-3.*

Fertilizer application was essential for quick growth and early fruiting of trees. It prevented alternate bearing of fruits like mango, litchi etc. The application of 10 seers of cow-dung, 1 seer of bone meal, ¼ seer of ammonium phosphate and 2½ seers of kitchen ash into the pit that was dug up for planting mango, guava, lemon and litchi was advocated. For aged trees, tentative recommendation was three maunds of cow-dung, 5 seers of bone meal, and 5 seers of mustard cake and 1 seer of ammonium sulphate per plant.

Agr. 670 Alam, M. Z. 1963. **Studies on the biology of mango fruit borer, *Sternonchetus frigidus* Fabr. (Curculionidae: Coleoptera) in East Pakistan.** Annu. Rep. Div. Entomol.

Biological studies of mango fruit borer, *Sternonchetus frigidus* Fbr. were conducted during 1960-61 and 1961-62 at two different places (1) Nababgonj, Dacca and Shibpur, Dacca. The nature and extent of damage and the time of infestation have been enumerated. Distribution of the pest in East Pakistan has been indicated. The different stages of the life history have been briefly described. Possible method of control have been suggested.

Agr. 671 Alam, M. Z. 1963. **Studies on the biology of mango fruit fly. *Chaetodacus ferrugienus* H. (Trypetidae: Diptera) in East Pakistan.** Annu. Rep. Div. Entomol.

Some aspects on the biology of mango fruit fly, *Chaetodacus ferrugienus* H. were conducted in different infested localities of East Pakistan. The feeding habits, nature and extent of damage and the time of infestation have been indicated. Life history study has also been briefly enumerated. Possible methods of control have been suggested.

Agr. 672 Alam, M. S. 1963. **Insect pests of mango in East Pakistan and their control.** Proc. 4th Pan Indian Oceanic Sci. Congr. Agr. Sci. Karachi.

Mango is one of the most delicious fruits of East Pakistan. The crop is the victim of a large number of insect pests. Twenty two different species of insects and two species of mites have been recorded as pests on this crop, of these nine species are new records in the region and six species are considered as major pests. Thirteen different species of curculionids infest the different parts of the crops. Then nature and extent of damage caused by these pests have been indicated and general biology of the major pests including methods of control have been discussed.

Agr. 673 Alam, M. Z. 1964. **Giant mealy bug, *Labioproctus polei* (Green) on mango leaf in East Pakistan.** 16th Pakistan. Sci. Conf. Lyallpur.

The Giant mealy bug, *Labioproctus polei* (Green) (Coocidae: Hemiptera) occurs in East Pakistan. The insect was first observed on mango leaf in Razabazar near Dacca Farm. Two mango trees were infested with the insect in May, 1972. In one case twigs were found severely attacked. The insect is very large in size considering other species of mealy bugs. The adult female insect measures about 15 to 18 mm long, broadly oval in shape and greenish yellow in colour. The body is covered with tubercles coated with a thick coating of yellowish white powdery waxy secretion. There are short waxy secretion. There are short waxy filaments around the margin of the body. Abdominal segments are distinct. Head is black. Both young (nymph) and adult suck from the mango leaf.

Agr. 674 Khan, K. H. and K. U. Ahmad. 1969. **Studies on the vigor of mango seed stones under different storage conditions.** M. Sc. (Ag.) Thesis. East Pakistan Agr. Univ. (MS).

The stock plants used in grafting are raised from seed stones which are collected usually at random and without any prior selection. This study was undertaken to find out right type of mango seeds and the best storing medium. Two types of mango, viz. syrupy pulp and firm pulp were used at the material from which seeds were collected. The syrupy pulp was represented by a local unnamed fruit. The variety used as firm pulp was Langra. The storage conditions consisted of no-storing (S_0) and storing in pit (S_1), storing in polythene (S_2) and storing in sand (S_2). In case of no-storing, the seeds were sown directly in the nursery beds and in case of all other treatments, the seeds were sown after a period of 60 days. Seeds from syrupy-pulp fruits were superior to the seeds from firm-pulp fruits in respect of percentage of germination, height of seedlings and basal diameter of the seedling. Direct sowing gave the best germination percentage (75.13). Among the various storage conditions, storing in pit gave the highest percentage of germination.

Agr. 675 Hakim. S. A., A. Husain and M. A. Siddique. 1972. **Propagation of mango by air layering with the help of Naphthalene Acetic Acid.** Bangladesh J. Biol. Agr. Sci. 1 (2): 21-23.

Air layering without Naphthalene Acetic Acid (NAA) and with the help of 1% and 2% NAB was practiced with Fazli variety of mango in two different times of the year, namely, Early June and Late August at the Horticultural Farm of the Bangladesh Agricultural University, Mymensingh. There was 94.75% and 81.25% success of air layers in rooting without use of NAA in Early June and Late August operations respectively. With the use of NAA in both 1% and 2% concentrations, there was 100% success in the rooting of air layers irrespective of the time of operation. Due to favourable rooting with the use of NAA the air layers showed better success in surviving after one month of detachment in comparison to the air layers without NAA treatment. There was 50% survival success in the Early June air layers treated with 2% NAA. In the same time of operation there were 37% and 12.5% success in case of air layers

treated with 1% NAA and without NAA, respectively. In the Late August air layers the survival success was comparatively low being 43.75%, 25% and 14.5% in case of air layers treated with 2% NAA, 1% NAA, and without NAA, respectively.

Agr. 676 Baroque, A. H. M. and M. M. A. S. Fakir, 1973. **Propagation of mango by different methods of grafting.** Bangladesh Hort. 1 (2): 25-28.

Success of contract, side, cleft and whip grafting on Gopalvog, Mohanvog, Langra and Fazlee varieties of mango was studied. In contact grafting where the root stocks were grown on earthen pots, there were 72% success for Langra and Fazlee and 68% for Gopalvog and Mohanvog varieties. 52%, 48%, 52% and 48% success were noticed in cases of Gopalvog, Mohanvog, Fazlee and Langra varieties respectively where the root stocks were grown on polythene bags in contact grafting. In side grafting 52%, 48%, 52% and 48% success were recorded on the above-said varieties respectively, whereas in cleft grafting, 48%, 52%, 52% and 48% success were observed. In whip grafting, the percentage of success on the varieties were 28%, 24%, 20% and 24% respectively.

Agr. 677 Mollah, S. and M. A. Siddique. 1973. **Studies on some mango varieties of Bangladesh.** Bangladesh. Hort. 1 (2): 16-24.

Fruits of twelve mango varieties, namely, Faze, Kohitur, Kalapahari, Koapahari, Langra, Chokchoka, Mohanvog, Kishanvog, Gobindavog, Ranipasanda and Bhaduri, collected from Rajshahi, were studied to present a detailed information on the composition and physical characters of the fruits.

Papaya

Agr. 678 Ahmed, K. U. and M. A. Basher. 1972. **A study to explore the possibility of the predetermination of sex in papaya at seedling stage in a population.** Bangladesh. J. Boil. Agr. Sci. 1 (1): 47-51.

No relationship has been found to exist between the sex of the papaya seed and the earliness and lateness of its germination. The vigour of the bisexual seedlings has perhaps no bearing on the sex of seedling. The other two sexes, i.e., the male and the female, seem to give some expression in the form of their vigour at the seedling stage. The weaker a seedling is in a mixed population, the more it is tended to be a female plant. There appeared to exist the possibility for the predetermination of sex of a papaya plant from its vigour at the seedling stage.

Pineapple

Agr. 679 Ali, M. K. and M. R. Talukdar. 1965. **Effect of planofix on the flower induction, maturity and fruit size of pineapple.** Pakistan Agr. 16 (2):

Two separate experiments were conducted at the Horticultural Orchard of Dacca Farm to study the effect of 'Planofix' on the flower induction, maturity and fruit-size of Honey Queen

variety of pineapple. Three hundred millilitre of the solution with a conc. of 1 ml. of 'Planofix' in 4.5 litre of dist. water was poured with a beaker into the core of each treated plant. In order to study the effect of 'Planofix' on the fruit size of pineapple, immature green fruits were selected at random and sprayed with the solution at a conc. of 10 ml. 'Planofix' in 4.5 litre of dist. water by an automizer. 'Planofix' treatment induced 100 percent plants to flower as against 37.5% in control. Flowering was earlier in the treated plants. 'Planofix' spraying increased the fruit size of pineapple significantly and delayed maturity. The mean weight of the treated fruits was 29.63 ounces at the time of harvest as against 24.69 ounces in case of control. The treated fruits however took 63.8 days to mature as against 46.0 days taken by the control fruits.

Agr. 680 Hussain, S. M. M., A. H. M. Faruque and M. A. Siddique. 1973. **Through growth regulators flower induction in pineapple.** Indian Hort. 18 (4): 11-12.

Three synthetic growth regulators namely, IBA, NAA and 2, 4-D in the concentrations of 0, 5, 10, 25 and 50 ppm were used. The chemicals in desired concentrations were sprayed in the whole of 8 to 9 months old pineapple plants by hand sprayer on May 23, 1969. NAA proved to be statistically superior to IBA and 2, 4-D in respect of flower induction of pineapple. Only 5, 10 and 25 ppm of 2, 4-D induced the maximum number (56.77%) of flowers.

Miscellaneous

Agr. 681 Siddique, M. A. and A. Husain. 1973. **A review of pomological research works done by the horticulture department of the Bangladesh Agricultural University.** Bangladesh Hort. 1 (1): 9-12.

All the research works in the field of fruit production done by the horticulture department of the Bangladesh Agricultural University during the last seven years have been reviewed in this paper. The paper includes the information regarding the introduction of some American varieties of mango, guava, star apple and passion fruit; vegetative propagation of citrus fruits, mango, guava, jack-fruit, litchi and jujube; and experiments on the use of growth regulators in fruit production.

Agr. 682 Siddique, M. A. 1973. **Effect of season in rooting performance of stem cuttings of some shrubby flower plants of Bangladesh.** Indian J. Hort. 30 (1-2).

The propagation by stem cutting can be advantageous in Land Lotus, Hasna Hena, Bottle Brush, Rose, Belli, Karabi and Gandharaj. Kamini stem cuttings did not root under the experimental conditions. Planting of cuttings on 1st March i.e., early spring planting of cuttings is the best time for vegetative propagation of the plants by stem cutting. In the present experiment highest percentage of success in rooting was observed in this season of planting the cuttings, while it was the lowest in 1st December planting.

Vegetables

Agr. 683 Bhuiyan N. I. 1971. **Studies on the ecology and development of bean BUG, *Coptosoma cribrarium* F. (Plataspidae : Hemiptera).** Proc. 23rd. Annu. Sci. Conf. Pakistan. 46-47.

The pest appears in the first week of September on *Dolichos lablab* and completes its generation in about 4 to 5 weeks. The adult lays eggs in batches of 20 to 80 on the lower surfaces of leaves. The egg-stage lasts for 4 to 6 days. The newly hatched larvae had strong tendency to remain in aggregation on tender twigs and this habit gradually disappeared as they passed into later stages of development. The larval colony could be recognized up to 3rd instar in the field and caused substantial damage to the tender parts of the plants. Fourth and fifth instar larvae moved independently when the food was favourably good and undisturbed. Fourth and fifth instar larvae showed antagonistic behaviour when two met on shoots. Larval mortality up to 3rd instar was high (50-60%). The population census of this bug was done at weekly interval in the morning hours when they were easy to count on the twigs. 300 healthy twigs were selected and tagged in three areas around the Agricultural University campus during September, October and November 1966, 1967 and 1969. It was found that the population increased from the last week of September and declined in the last week of December. The bean plants already infested by bean aphid were not attacked by this bug.

Agr. 684 Chowdhury, A. T. M. S. and A. H. M. Faruque. 1973. **Pinto, a new variety of bean for Bangladesh.** Bangladesh Hort. 1 (1): 37-38.

The pinto bean (*Phaseolus vulgaris* cv. Pinto), a member of the sub-family papilionaceae originally developed at the California Agricultural Experiment Station was introduced at the Bangladesh Agricultural University Farm. The crop yielded 1529 lbs. per acre. In the present study 95% of the house-wives of Bangladesh Agricultural University Campus liked the pinto bean seeds better than the local beans (*Dolichos lablab*). The study revealed that the newly introduced variety of bean will have a tempting prospect in Bangladesh in the future.

Brinjal

Agr. 685 Alam. M. Z. and D. L. Sana. 1962. **Biology of the brinjal shoot and fruit borer *Leucinodes orbonalis* G. (Pyralidae: Lepidoptera) in East Pakistan.** The Scientist. 5 (1-4).

The brinjal shoot and fruit borer, *Leucinodes orbonalis* Guenec is the most important pest of brinjal in East Pakistan. During 1960 and 1961 some aspects on its biology were studied. The distribution of the pest has been enumerated. Feeding habits, nature and extent of damage have been stated. The different stages with their morphological characters have been described. Different natural enemies with their influence on the pest have been indicated.

Agr. 686 Haque, A. and K. U. Ahmad. 1962. **Effect of pruning and spacing on the performance of *Solanum melongena***. M. Sc. (Ag.) Thesis. Dac. Univ.

A study on the effect of pruning and spacing on the performance of *Solanum melongena* was taken with Islampuri variety. Four spacing, such as 2' x 2', 3' x 2', 3' x 3' and 4' x 3' and three prunings such as no pruning, pinching off of lateral buds and pinching off of terminal bud were involved. The closest spacing gave the highest yield per plot. The yield gradually got reduced as the spacing was increased. As the spacing increase, the number of fruits per plant increased. Lateral bud-pruned plants gave much better-sized fruits than those of other treatments, whereas un-pruned plants gave fruits of better size than those given by terminal bud pruned plants.

Agr. 687 Kabir, S. M. H. and A. K. M. Rahman. 1971. **Field tests of insecticides against the eggplant pest complex**. J. Economic Entomol 64 (3): 758-759.

Spray applications of diazinon and Imidan effectively controlled the infestation of several species of insect pests of egg plant, Imidan 0.1% spray, however, provided the best control. Diazinon although effecting a marked degree of control, was not so effective as was Imidan. Of the test insecticides, dichlorvox offered the best plant protection.

Agr. 688 Mannan, A. and M. Z. Alam. 1971. **A study on the effect of organophosphorus insecticides, anthio, gardona and Malathion for the control of brinjal shoot and fruit borer**. M. Sc. (Ag.) Thesis. East Pakistan Agr. Univ. (MS). 64 p.

Effectiveness of some organophosphorus insecticides were assessed in controlling brinjal shoot and fruit borer, *Leucinodes orbonalis* G. The experimentl results showed that greater reduction in symptoms of shoot and fruit attack was achieved with the applications of Gardona 0.075% at an interval of 10 days. This treatment also gave the highest fruit yield.

Agr. 689 Siddique, M. A. and A. Husain. 1971. **A comparative study on the external morphology and yield of six varieties of Brinjal (*Solanum melongena* L.)**. Pakistan J. Sci. 23 (3-4): 99-106.

In order to select the best yielding variety of brinjal and to assess the distinguishing morphological characters and other related features of them, a study was made during the period from August, 1967 to February, 1968 in the East Pakistan Agricultural University Horticultural Farm. Six varieties, namely, Ishuradi-1, Islampuri, Talla, Khotkotia, Shingnath and Black Beauty were included in the study. To attain the above objectives, studies were made on the plant habits, number of branches and leaves, leaf size, period required for flowering, inflorescence and floral characters, fruit setting ability, fruit characters and yielding ability of the above mentioned six varieties of brinjal. Under the experimental condition, Talla was noted to be the highest yielder followed by Shingnath variety. The introduced Black Beauty variety exhibited a very poor yielding ability and considered to be

the most inferior among all the varieties under the environmental conditions of the experiment.

Agr. 690 Siddique, M. A. 1972. **Quality brinjal-a Bangladesh study**. Indian Hort. 17 (3): 12-13.

The study was conducted at the Horticultural Farm of the Bangladesh Agricultural University. Fruit qualities of varieties of brinjal, namely Ishurdi-1, Islampuri, Talla, Khotkhotia, Shingnath and Black Beauty were recorded. The first five varieties are local and the last one is an American variety. The characters studied were shape of the fruit, length and circumference of the fruit, individual fruit weight, fruit colour, seediness of the fruit and taste as a cooked vegetable. The fruits of the variety Talla, Islampuri and Black Beauty were of good marketable quality having attractive size, shape and colour. The lowest record of seediness was found in the fruits of Islampuri. The fruits of Islampuri, Talla and Black Beauty were very tasty when used as fry. The fruits of Khotkhotia were the best when used as boiled curry.

Cabbage and Cauliflower

Agr. 691 Rahman. M. 1964. **The ecology and control of cabbage white butterfly, *Pifris rapae***. Rept. Waite. Agr. Res. Institute 51.

Work has centered upon the study of the parasites of *P. rapae*; two braconids *Apanteles rubecula* and *A. glomerata*, a pteromalid, *Pteromalus puparum*, and a hitherto unknown parasite, the tachinid *Exorista flaviceps*. It has been found that *A. Glomertus*, a gregarious parasite, is abundant in early spring and late autumn, whilst the solitary parasite, *A. rubecula* is abundant in late spring, summer and early autumn. Laboratory experiments have shown that both these insects will lay their eggs into hosts that are already parasitized, either by their own species or by the other, but when this occurs only *A. rubecula* emerges, except if *A. rubecula* lays its eggs into the host more than three days after, *A. glomeratus* has oviposited. However, *A. glomeratus* required a lower temperature for development than *A. rubecula* and so can start developing earlier and continue longer into cooler months than *A. rubecula*. The two species are thus able to co-exist. *P. purparum* is widespread, but it is not so numerous as the two braconids *E. flaviceps* has been found in a few localities only. It is probable that it is a native insect and has become adapted to using *P. rapae* as a host. It lays its eggs on the mature larvae and the parasites can complete their life cycle, provided the eggs hatch and the young parasite larvae bore into the host just before it pupates. If it pupates first the larvae die, and if they hatch and bore in too early the host dies.

Agr. 692 Rahman. M. 1970. **Mutilation of the imported cabbage worm by the parasite *Apanteles rubecula***. J. Econ. Ent. Vol. 63 (4): 1114-1116.

In a laboratory experiment conducted at the Waite Agricultural Research Institute, University of Adelaide, 2-to 7 day old larvae of cabbage white butterfly, *Pieris rapae*(L.), (known in the United States as the imported cabbage worm) were exposed to the female hymenopterous parasite *Apanteles rubecula* Marsh. It was found that during the act of oviposition the smaller caterpillars were evidently killed by being mutilated by the parasite. As many as 70% of 2-day old larvae died, as compared to less than 10% of the 7-day-old larvae. This parasite apparently does not consider age when it selects larvae in which to oviposit and is possibly responsible for a considerable number of deaths that occur among small *P. rapae* in South Australia.

Agr. 693 Bhattacharjee, A. K., A. Husain and M. A. Siddique. 1970. **A study on the possibility of having quality seed from five cauliflower varieties under East Pakistan conditions**. Punjab Fruit J. 32 (112-113): 25-27.

The introduced Snowball Y produced the highest amount of seed followed by Early Snowball A. The treatments, Potting and isolation and cross-cut in the flower heads totally failed to produce seed. Among the successful treatments, the control method i. e. keeping the plants in situ was found to be superior with respect to the amount of seed yield. The local Agraphayani variety failed totally to produce seed. The seeds of the local Poushali variety matured earlier in comparison with the Snowball types. Seed production by control method was delayed while earliest seed production was shown by the treatment, incision of roots. Germination percentages of the produced seeds of Snowball Y (97%) and Snowball 421 (96%) were very promising but that of Early Snowball A (4%) and Poushali (16%) were very discouraging. It appears that seed production of cauliflower under East Pakistan climatic conditions seems to be not so much encouraging. But it may be suggested to conduct trials on the seed production of cauliflower in some northern districts of East Pakistan where the winter weather conditions (especially temperature) are considered to be more favourable for cauliflower seed production. Vernalization of seed and plant may also be tried for early and better seed production of cauliflower.

Agr. 694 Bhattacharjee, A. K., A. Husain and M. A. Siddique. 1972. **A study on the performance of five cauliflower varieties as a basis for selection under Bangladesh conditions**. South Indian Hort. 20 (1-4): 50-54.

A study was made on three introduced cauliflower varieties, viz., Snowball Y, Snowball 421 and Early Snowball A in comparison with two local varieties, viz., Poushali and Agraphayani under Bangladesh conditions. The plants of the introduced varieties were taller and with maximum number of leaves per plant than those of the local varieties. The introduced Snowball 421 plants attained the maximum height with the highest number of leaves per plant. The local varieties required the minimum period for the visible initiation of flower buds

and for the maturity of the heads in comparison with introduced varieties. Snowball 421 was the latest in this respect. Early snowball produced mature heads with the maximum average depth and average weight. Snowball Y produced heads with the maximum average diameter. The average diameter, depth and weight of the heads were the lowest in the variety snowball 421. The introduced variety snowball Y was superior to all the varieties of cauliflower under report followed by Early Snowball A in respect of yield and size of mature heads.

Cucurbits

Agr. 695 Milki, G. and K. U. Ahmad. 1963. **Influence of defoliation and artificial pollination on the fruit setting and yield of cucumber plant.** M. Sc. (Ag.) Thesis. Dac. Univ. (MS).

A study was undertaken to know the effect of defoliation and artificial pollination on the production of cucumber. The first set of treatments consisted of 4 treatments such as no defoliation, removal of every sixth leaf, removal of every third leaf and removal of every alternate leaf, and the second set consisted of artificial pollination and natural pollination. Neither defoliation nor artificial pollination had any effect on the time taken for opening of the first flower counted from the date of sowing of seeds. The number of male flowers was found to be maximum when plants were left un-defoliated, but this number gradually decreased with the severity of defoliation. The number of fruits borne by a plant and total yield of fruits was not affected by either defoliation or artificial pollination.

Agr. 696 Alam. M. Z. 1966. **Test of systemic action of dimecron, bidrin, sayfos and aphidan for the control of cucurbit aphid in Dacca farm.** Annu. Rep. Div. Entomol.

Cucurbit aphid, *Aphis fabae* L. is sometimes a serious pest of some gourd crops especially the bottle gourd. The older leaves of bottle gourd are generally infested with the aphid which cause considerable damage when there is an abundance of population. When the population of the pest become high, the insect migrates to other plants nearby. An experiment was conducted with four organophosphorus insecticides, Dimecron, Bidrin, Sayfos and Aphidan in a bottle gourd "machan" in Dacca Farm during December, 1965 to test the systemic action on the plants for killing the pest.

Agr. 697 Alam, M. Z. 1968. **Cucurbit fruit fly, *Dacus cucurbitae* coquillett (Trypetidae; diptera) in East Pakistan.** Annu. Rep. Div. Entomol.

The cucurbit fruit fly, *Dacus cucurbitae* Coquillett is the most serious pest of all the cucurbit fruits grown in East Pakistan. The distribution of the pest has been enumerated and the various food plants are enlisted. The feeding habits, nature and extent of injury in each type of cucurbit fruit have been discussed. Different stages of the life history have been described. Control methods evolved on the basis of the field trials have been recommended. Among the control methods, foliage bait spray, destruction of adult flies by chemical insecticides, or

chard sanitation protection of fruits by bags, heat treatment and use of atomic radiation have been discussed.

Agr. 698 Ali, M. H. and A. Husain. 1970. **The effect of naphthalene acetic acid on seed production in pumpkin (*Cucurbita moschata* Poir).** Nucleus. 7 (1-2): 47-51.

Naphthalene acetic acid application on the pistillate flowers responded significantly in accelerating seed production in pumpkin. Maximum number of seeds were obtained at 100 ppm of NAA irrespective of cultivar with an interaction effect between cultivar and different concentrations of NAA. However, this chemical showed a positive effect in relation to the objective of the experiment.

Agr. 699 Ali, M. H., A. Husain and M. A. Siddique. 1971. **Effect of Naphthalene acetic acid on fruit set in four cultivars of pumpkin (*Cucurbita moschata* Poir).** Pakistan J. Sci. 23 (1-2): 12-16.

Both cultivar and the application of NAA influenced fruit setting and yield significantly. However, there was no significant interaction effect between the cultivar and the four different concentrations of NAA. There was a corresponding increase with the increase of the concentration of NAA in the percent fruit set and yield but the rate of increase gradually decreased with higher concentration beyond 50 ppm NAA. The highest fruit set and yield were obtained in cultivar 4 with the application of 100 ppm NAA and were followed by cultivars 1, 2 and 3 in descending order. The results of the present investigation revealed that NAA at 100 ppm concentration appears to offer promise for increasing the fruit set and yield of pumpkin.

Agr. 700 Ali, M.H., A. Husain and M. A. Siddique. 1973. **Studies on some pumpkin cultivars of Bangladesh.** Punjab Vegetable Grower. 8 (2): 3-6.

In Bangladesh, pumpkins varying in size and shape are in cultivation. These are presumed to belong to different cultivars. Four types of pumpkins exhibiting a considerable amount of variability with respect to size, shape and number of seeds etc. were used for the present study. The plants raised from the seeds of different cultivar types consistently produced fruits of similar size and shape.

Agr. 701 Islam, M. N. 1973. **Effect of Succinic acid 2, 2-Dimethylhydrazide on the growth and development of bottle gourd.** M. Sc. (Ag.) Thesis. Bangladesh Agr. Univ. (MS).

Effect of Alar (Succinic acid 2, 2-Dimethylhydrazide) on the growth and development of bottle gourd was investigated. The growth regulator slightly reduced the length of the internodes but did not affect the total length of the stems, increased the number of male and female flowers by 19 and 50 percent respectively, decreased the rate of growth of the fruits and the number of seeds per fruits significantly. Effect of Alar was more pronounced at 4000

ppm than at 2500 and 1000 ppm. A majority of the fruits produced by the treated plants had persistent style and stigma up to maturity.

Potato

Agr. 702 Ishaque, M. and H. Ashrafuzzaman. 1961. **Some post-cold storage observation of potatoes in East Pakistan.** Agr. Pakistan 2 (2): 259-263.

In 1960 about 22,000 maunds of potatoes of Holand and Shillong varieties were stored in cold storage. The condition of potatoes were examined after they had been in the cold storage for about 5-6 months. On examination it was found that about 95 percent of the potatoes remained in condition suitable for seed and consumption purposes. Of the remaining 5 percent were found with disease (about 4 percent with dry rot and the rest with scab and bacterial rot). Presumably the diseased potatoes were introduced into the cold storage at the time of storing and by careful selection at the time of storing it may be possible to avoid the diseased potatoes.

Agr. 703 Kamal, A. M. A. 1964. **Effect of variety, method of culture and spacing on the yield of potato tubers.** M. Sc. (Ag.) Thesis. East Pakistan Agr. Univ. (MS). 68 p.

An experiment was conducted in the East Pakistan Agricultural University Farm, Mymensingh with three varieties of potato, three methods of culture and three spacing. The effect of variety was highly significant. The two foreign varieties increased the yield more than the local one. Ridging produced the greatest number of tubers among the 3 methods of culture. Spacing had significant effect on all the characters studied. With increasing spacing, number and yield of tubers increased significantly.

Agr. 704 Alam, M. Z. 1965. **Effects of some soil insecticides on the control of potato ants in East Pakistan.** Proc. 17th Pakistan Sci. Conf. Karachi.

Two species of ants, *Dorylus orintalis* W. and *Pheidologeton diverssus* Jerd. Are important pests of potato in the field? These ants cause serious damage to potato tubers on high land potato crops. They live in soil and feed on roots and tubers newly formed. As a result of the attack of pests the tubers became perforated and unfit for consumption. A study was made in 1963-64 winter season on the control of these ants using Aldrin, Dieldrin, Chlordane and Heptachlor under field condition in Dacca Farm. Three dosages viz., 1 pound, 2 pounds and 4 pounds (active material per 100 gallons per acre) of each insecticides were used.

Agr. 705 Bari, A. K. F. and I. H. Khan. 1966. **Comparative yield of three different potato varieties with combination of fertilizers.** M. Sc. (Ag.) Thesis. East Pakistan Agr. Univ. (MS). 112 p.

An experiment was conducted at the Bangladesh Agricultural University Farm, Mymensingh with three varieties of potato, three levels of nitrogen and 3 levels of K₂O to find out the highest yielding variety along with the suitable combination of fertilizer doses. Eigenheimer

was significantly superior to the other two varieties in producing the number of grade 'A' tubers both per plant and per plot, and lower grade of tubers was produced by Shau variety. 30 lb. nitrogen per acre was responsible for highest number of grade 'A' tubers while 60 lbs. nitrogen/acre increased the grade 'B' tubers. In all the varieties 60 lbs. nitrogen/acre and 60 lbs. K₂O/acre significantly favoured the length, breadth, and area of the tubers.

Agr. 706 Kamal, M. S. 1966. **A pot trial to study the effect of nitrogen, phosphorus and potassium on the yield and yield contributing characters of potato.** M. Sc. (Ag.) Thesis. East Pakistan Agr. Univ. (MS). 84 p.

A pot trial was conducted to find out the effect of nitrogen, phosphorus and potash at various levels (each at 4 levels) on potato in the Bangladesh Agricultural Institute Farm, Dacca. Nitrogen and phosphorus progressively and significantly increased the number of tubers, size of tubers and tuber yield. The potassium effects was also significant except 80 lbs. K₂O/acre. It was further observed that phosphorus was most effective in increasing number of shoots, whereas nitrogen was least in respect of height of shoots, yield of tubers.

Agr. 707. Ahmad, K. U. and A. Quasem. 1967. **A study on the performance of the different sizes of cut seed potato when compared with whole seed potato.** Agr. Pakistan 19 (1).

A split plot experiment was conducted at Dacca Farm to study the performance of the different sizes of cut seed potato as compared with whole seed potato. The experiment which involved four main treatments consisting of 4 different sizes of seed tubers, viz. ½ oz., ¾ oz., 1 oz., and 1¼ oz. and sub-treatments of whole and cut tubers with the spacing of 2' x 1' and plot-size of 44 sft. revealed that whole tubers performed better in respect of germination and yield per plot. The lower yield of cut tubers resulted from lower germination percentage as well as an attack from a rhizoctonia species which affected the plants from cut tubers seven times more than the whole tubers. As the size of the seed pieces increased, the number of shoots per plant increased. The number of tubers per plant increased with the increase in the size of seed piece. There was a gradual increase in the yield per plot with the increase in size of seed potato. Although the whole seed piece of the size of 1¼ oz. gave the highest yield of 182.6 maunds per acre, yet the seed piece of 1 oz. was found to be the most economic in size, its yield of 178.2 maunds per acre being statistically similar to the other. It was felt that cut potatoes should be avoided as far as possible.

Agr. 708 Khan, A. A. 1967. **A study of some factors affecting infection and development of potato gangrene.** Rec. Agr. Res. 16 (2): 97-101.

Although *P. foveata* can infect tubers through eyes and lenticels under moist conditions, the infection and development of potato gangrene mainly depend on the interaction of two factors (1) tuber damage and (2) low storage temperature. High humidity encourages rot development in the cortex while low humidity induces deeper penetration into the pith. Storage at 21-22°C for seven days after inoculation arrested infection. The pre-infection temperature effect on subsequent gangrene development was not always marked.

Agr. 709 Khan, A. A. and C. Logan. 1968. **A preliminary study of the sources of potato gangrene infection.** *Euro Potato J.* 2: 77-87.

Using a tuber-baiting method, *Phoma foveata* and occasionally *P. solanicola* were recovered from N. Ireland soils where potatoes were grown in the previous year and from somewhere a potato crop had not been grown for over 5 years. *P. foveata* was consistently isolated from a proportion of stems produced by gangrene affected tubers, grown in sterilized soils, from 5 weeks after planting to maturity; no symptoms were visible until stems began to show signs of senescence when pycnidia formed on their surfaces. The incidence of infection was high in both stems and tubers from plants grown in soils heavily contaminated by inoculation with *P. foveata* or produced by gangrene-affected parent tubers, the lowest incidence being in stems and tubers 'healthy' seed grown in soil neither sterilized nor inoculated. The close relationship between the incidence of stem infection on plants grown in variously treated soils contained in sunken polythene bags, and tuber infection in storage provides a possible method of predicting potential storage losses.

Agr. 710 Shaikh, M. A. Q. 1971. **Potato breeding: problems, achievements and prospects.** Nucleus. (Karachi). 8 (1-2): 32-41.

Different breeding methods are being tried in many parts of the world for obtaining better strains of potato. But a thorough investigation on the possibility of greater efficiency in different approaches to potato breeding is thought to be wanting. This paper deals with the problems involved in potato breeding, modes of inheritance of different characters, the achievements attained through different approaches to breeding and discusses the more recent breeding methods.

Agr. 711 Eunus, M. and Razzaque. M. A. 1973. **The effect of seed size and plant spacing on the yield and grades of potato (*Solanum tuberosum*).** Res. Rep. Dep. Agron. Bangladesh Agr. Univ.

An experiment was carried out to determine the effect of 4 different seed sizes (28.4g, 42.5g, 65.7g and 70.9g) and 4 plant spacing (10.2 cm., 15.2 cm, and 30.5 cm) on a constant row spacing of 76.2 cm on the yield and grades of potato at the farm of Bangladesh Agricultural University during the period from December 1972 to March 1973. Seed tuber size weighing 70.9g produced maximum tuber yield (12, 796.43 kg/ha) followed by 56.7g (10,925.29 kg/ha), 42.5g (10,013.33 kg/ha) and 28.49 (8,770.76 kg/ha). This difference in yield was found to be significant at 1% level. Seed tuber size weighing 42.5g and 56.7g produced statistically identical tuber yield. Although the wider plant spacing 76.2 cm x 30.5 cm, 76.2 cm x 22.9 cm and 76.2 cm x 15.2 cm produced increased number of shoots/hill and increased numbers/hill yet an overall increased tuber yield per unit area was resulted from the closer spacing of 76.2 cm x 10.2 cm, because the increased yield/hill could not favourably compensate the higher yield due to the larger plant population in closer spacing. The 100-

tuber weight was not influenced significantly but the trend of its increase was associated with larger sized seed and wider spacing.

Agr. 712 Farooque, A. H. and A. Hussain. 1973. **Studies on the comparative morphological characters and yield of seven varieties of sweet potato.** *Bangladesh Hort.* 1 (2): 37-44.

To compare the yielding ability and to assess the distinguishing external morphological characters of seven varieties of sweet potato, an investigation was carried out in the Agricultural University Farm, Mymensingh during the period from November 1971 to April 1972. The varieties studied were, Nancy H Porto Rico, Centennial, A. U. Selection No. 2, White Local, Pelican processor and Julian. They yielded 196.98, 201.43, 200.00, 222.06, 186.00, 198.00 and 196.98 maunds of tuberous roots per acre respectively. Under the experimental conditions, A. U. Selection No. 2 was found to be statistically superior to the rest of the varieties.

Agar. 713 Hussain, M. A. 1973. **Effect of method of culture and depth of planting of seeds on the yield of potato.** M. Sc. (Ag.) Thesis. Bangladesh Agr. Univ. (MS).

Three methods of culture (ridge, mulch, and flat) with three depths of plantings (1", 2", and 3") of seeds were compared. Depth of planting did not affect the time of emergence of the plants but it influenced the height of the plants. Tallest plants were obtained from planting at a depth of 3" followed by 2" and 1" respectively. Deeper planting also resulted in an increase in the number of underground nodes but this did not lead to any increase in the number of stolons and tubers. Among the methods of culture, mulching produced taller plants and gave significantly higher yield as compared to the other methods. Depth of planting did not have any effect on the yield of tubers.

Agr. 714 Khan, A. A., and M. G. Kibria. 1973. **A note on the outbreak of sclerotium wilt disease on potato at the Bangladesh Agricultural University Farm.** *Bangladesh Hort.* 1 (2): 80-81.

The disease was first observed in 1968 at the Bangladesh Agricultural University Farm on four varieties of potato. Of all the potato varieties grown in the University Farm in 1971. Eigenheimer showed maximum infection of about 25% of the total plants. The causal organism *Sclerotium rolfsii* Sacc. was isolated and the effect of different media and pH on the mycelia growth and sclerotia formation was observed.

Agr. 715 Taleb, A., A. Husain and A. Siddique. 1973. **Effect of seed size and spacing on the yield of potato.** *Indian. J. Agr. Sci.* 43 (3): 237-240.

An experiment was conducted to determine the effects of different seed size and spacing on the yield of potato at the Bangladesh Agricultural University during October 1969 to January 1970. The treatments consisted of all combinations of 3 sizes of seed potato (14 to 28g, 28 to

35g and 42 to 57g), 3 row-to-row spacing (40.5, 61.0 and 81.0 cm) and 3 plant-to-plant spacing (15.0, 23.0, and 30.5 cm). Seed up to of 42 to 57g when planted at spacing of 40.5 cm x 15.0 cm. gave the highest gross yield of 325.69 q/ha, giving a seed : yield ratio of 1: 4.5. But the highest net yield and a considerable financial return was obtained from the seed potato of 14 to 21g when planted at a spacing of 40.5 cm x 15.0 cm. This treatment gave the gross yield of 311.44 q/ha, with a seed: yield ratio of 1 : 10.

Tomato

Agr. 716 Faruque, A. H. M. and K. U. Ahmad. 1960. **Influence of pruning, mulching and fertilizing with super phosphate on the yield and extension of picking period of tomato.** M. Ag. Thesis. Dac. Univ. (MS).

An experiment was undertaken at Dacca Farm to study the effect of pruning, mulching and the application of superphosphate on the yield and picking time of tomato. There were three sets of treatments. Pruning treatments were : pruning of two lower most shoots, pruning of four lower most shoots, and no pruning; mulching treatments were : straw mulching, water-hyacinth mulching and no mulching; and application of superphosphate were: at the rate of 200 lb., 400 lb. and no application. The results indicated that only mulching had significant effect upon the setting of flowers and total yield of tomato. Straw mulched plants produced the highest yield; the next highest yield was obtained from the interaction of straw mulching and pruning of two lower most shoots. Application of triple super phosphate which was done after the transplanting of plants did not have any differential effect. None of the three sets of treatments affected the yields obtained at different picking periods. Tomato plants yielded most heavily during the early part of their fruiting and the yield declined gradually until the end of the growing periods. None of the treatments had any effect on the extension of the picking period of tomato.

Agar. 717 Bhuiyan. N. I. 1970. **Studies on the soil application of systemic organophosphorus insecticides to control aphids and fruit borer on tomato.** Res. Report Evaluation Coordination Committee, Directorate Agr. Govt. East Pakistan. 2 p.

Soil application of PSP-204 (0, 0-ditsoprophyl-ethyl sulfinylmethyl dithiophosphate 5% granules) of Hokko Chemicals of Japan, treated with fertilizer on tomato plants 15 days after transplantation gave an excellent control of aphid, *Aphis craccivora* Koch. and fruit borer, *Heliothes obsoleta* Fb. The maximum yield (3.5 lbs/plant) obtained when the plants were treated with 0.2 grams of insecticide per plant with urea. Flowering and fruiting were delayed above 0.5 grams of insecticide per plant, and the growth of plants accelerated. When plants were treated with 0.2 grams of insecticides mixed with triple super phosphate or muriate of potash only, fruiting and ripening were much delayed.

Agr. 718 Kabir, S. M. H. and M. H. Khan. 1971. **Effects of Diazinon, dieldrin and superacide on seedlings of tomato, eggplant and cabbage.** J. Econ. Entomol. 65 (4): 1179-1183.

Supracide exhibited no significant effect on plant growth except in tomato. The insecticide, however, at 200 mg/plant reduced the weight of eggplant and cabbage and produced characteristic marginal necrosis in the leaves of cabbage and tomato. Diazinon at 200 mg./plant showed a pronounced growth-stimulating effect in egg plant and slightly in cabbage. Dieldrin at the higher dosage inhibited growth of tomato, the leaves of which showed chlorosis and characteristic curly appearance. It also significantly increased the weight of cabbage mostly because of thickening of the leaves and stem. At 200 mg./plant, this insecticide caused reduction in the weight of tomato plants, but the height and weight of the egg plants markedly increased.

Agr. 719 Choudhury, S. H. and A. H. M. Faruque. 1973. **Effect of PCA and GA on seedlessness of tomatoes.** Bangladesh Hort. 1 (1): 13-16.

The effect of parachlorophenoxy acetic acid (PCA) and Gibberellic acid (GA) at 50, 100 and 200 ppm on seedlessness of tomatoes was studied in the horticulture farm of Bangladesh Agricultural University. Growth regulators were applied at the pre-anthesis stage of the flowers. Seedlessness, puffiness and fruit weight were studied. The percentage of seedless fruits was higher with the increase in concentrations of the growth regulators. PCA gave higher percentage of puffy fruits than GA. Fruit weight seemed to be decreased with the GA treatment. PCA did not affect the fruit weight.

Agr. 720 Hossain, A. K. M. A. and K. U. AHMAD. 1973. **A comparative study on the performance of different varieties of tomato.** Bangladesh Hort. 1 (1): 44-46.

A comparative study was undertaken amongst different tomato varieties grown in Bangladesh along with a new variety named 'Anabel' which was evolved through gamma radiation at the Atomic Energy Center, Dacca. Plants were spaced 1½ ft. in rows placed 2 ft. apart. Sanmarzano, a popular variety of Bangladesh was the highest yielder with 313.9 maunds per acre, followed by Oxheart (311.2), another popular variety, Koma (307.7), Bungaria (304.9), USA (293.7) and Anabik (184.5). Anabik was therefore, the lowest yielding plant. But that variety was found to be a very small, determinate plant that needed no support and could be accommodated with much shortened spacing.

Miscellaneous

Agr. 721 Begum, J. A. and K. G. Weckel. 1972. **A study of the effects of AM42 (Corn sirup) on the quality and acceptability of canned vegetables.** Bangladesh J. Biol. Agr. Sci. 1 (1): 11-25.

The effects of corn sirup (AM42) on the color properties, texture qualities, and flavour acceptabilities of five different canned vegetables were studied. Canned vegetables were

processed with brine solutions containing various proportions of sucrose and corn sirup at two different levels of sugar slids (2.5 & 5.0%). Measurements of drained weight, texture, and color were made after the equilibration of canned vegetables at 40⁰F and 90⁰F for various periods. The drained weight and texture of canned vegetables were not affected by the inclusion of corn syrup (AM42) in the brine. The Hunter colour values L (lightness) values of all the canned vegetables and ^bL (yellowness) values of all but canned peas were affected significantly by the use of AM42 in the brine solution. The ^aL (redness) values of canned peas, lima beans, and whole kernel corn were increased at higher replacement of sucrose in the brine. The Hunter color values of certain vegetables subjected to steam table treatments were affected by the presence of corn syrup (AM42) in the brine. The flavour of canned vegetables were not affected significantly by the inclusion of AM42 in the brine. The quality of canned vegetables packed with brines containing up to 50% replacement of sucrose by AM42 was approximately equivalent to those packed with brines containing only sucrose.

Agr. 722 Bhuiya, Z. H., M. S. Islam and M. A. Sattar. 1973. **The yield response of onion to N, P and K fertilizers.** *Indian. Hort. J. (In Press)*.

A fertilizer trial on onion (*Allium cepa* L.) was conducted with 2 levels of phosphorus and 2 levels of potassium in the Noncalcareous Dark Grey Floodplain soil of Bangladesh Agricultural University Farm, Mymensingh.

The application of nitrogen, phosphorus, and potassium significantly increased the onion yield.

Agr. 723 Fakir, G. A. and M. U. Ahmad. 1973. **An epidemiological note on late blight of potato and tomato occurring in Mymensingh.** *Bangladesh Hort. 1 (2): 73-76.*

Outbreak of late blight of potato and tomato was observed in the Sadar Subdivision of Mymensingh District for three years (1970-73). The disease was recorded on six varieties of potato and eleven varieties of tomato. During 1970-71 the disease broke out in serious epidemic form. The prevalence of the disease was found to be related with the weather conditions, specifically with the cloudiness, rainfall/relative humidity and temperature. Introduction of a weather forecasting system for the disease by different weather centres of Bangladesh has been emphasized for the benefit of the potato and tomato growers.

Agr. 724. Fakir, M. Hashmatullah and M. A. Wadud Mian. 1967. **Seedling disease complex of *Lycopersicum esculentum*.** M. Sc. (Ag.) Thesis. East Pakistan Agr. Univ. (MS). 39 p.

Varying degrees of pre-and post-emergent mortality was observed in four varieties of tomato (Gloriana, Indian River, Pinkdeal and M-60) planted in seedbeds, *Rhizoctonia solani* and *Fusarium oxysporum f. lycopersici* were isolated from the diseased seedlings. *R. solani* was the most predominant isolate. Varietal reactions in vitro were studied against these two pathogens. *R. solani* caused more pre-emergent death while *F. oxysporum f. lycopersici*

caused high post-emergent mortality. All the four varieties of tomato were found to be susceptible to both the pathogens.

Agr. 725 Islam, M. A. and M. M. Rashid. 1973. **Tolerance of different winter vegetables to the foliar application of urea.** Bangladesh Hort. 1 (2): 12-15.

In order to determine the tolerance of the different winter vegetables to the foliar application of urea, full grown plants of sixteen vegetable crops were sprayed with its aqueous solution at different concentrations. The minimum concentrations at which symptoms of injury appeared in the foliage of the crops in pounds per 100 gallons of water tomato 10, pepper 8, brinjal 14, potato 18, cauliflower 10, cabbage 12, radish 14, turnip 16, leaf mustard 12, onion 18, garlic 18, lettuce 8, battle gourd 8, pea 12, hyacinth bean 10 and carrot 22. The maximum safe concentration for each of these crops should be at least two pounds less than the concentrations at which symptoms of injury developed.

Agr. 726 Siddique, M. A. 1973. **Vegetable growing in Bangladesh.** Punjab Vegetable Grower, 8 (4): 21-23.

The paper dealt with the present situation of vegetable growing in Bangladesh. A note on the climatic condition and soil type of Bangladesh in relation to vegetables growing, researches on vegetables and some prospects, problems and suggestion have been made in the paper.

Narcotic crops

Tobacco

Agr. 727 Alam, M. Z. 1964. **Notes on the aphid transmission of the tobacco mosaic disease.** *16th Pakistan Sci. Conf. Lyallpur.*

Tobacco mosaic, a virus disease of tobacco, was first observed and recorded by the author in 1965 at Dacca and Burirhat Tobacco Farm, Rangpur in East Pakistan. In recording the disease he did not determine the etiological agent. Upton the present time there has been no mention of the manner in which this virus is disseminated under natural condition. In 1960 it was observed that the aphid infested plots or areas were generally affected with the mosaic. Since then the author took keen interest to find out the cause of the mosaic as it was suspected to be transmitted by insect. The object of this paper is to report a species of aphid, *Myzus persicae* (Sulzer) as vector of the mosaic.

Agr. 728 Bhuiya Z. H., K. Anam and A. Rashid. 1969. **The effect of different rates and composite NPK fertilization on the quality and yield of Virginia Tobacco in Rangpur Soil.** *Dac. Univ. Stud. 16 (B) P-1-114.*

An attempt has been made to study the optimum requirement of NPK of Virginia Tobacco in Rangpur Soil. (NPK) at the rate of 19-90-110 lbs./acre gave best result. But the application of Boron along with the above mentioned ratio NPK surpassed the result obtained by only NPK surpassed the result obtained by only NPK at ration (19-10-110)/acre. It shows Boron claims an important consideration while finding out the best dose of balanced fertilization for Virginia Tobacco in Rangpur Soil.

Agr. 729 Islam, M. A. and M. Sanaullah. 1970. **Observation on heterosis and cytoplasmic effect in *Nicotiana tabacum* L.** M. Sc. (Ag.) Thesis. East Pakistan Agr. Univ. (MS).

Reciprocal crosses among three cigarette tobacco varieties-virginia, Burley-1 and Maryland mammoth of *Nicotiana tabacum* were made to estimate heterosis and cytoplasmic effect for days to flower, number of leaves, leaf length at maturity, leaf breadth at maturity, plant height and curled leaf yield. Their F₁ hybrid exhibited significant heterosis in the form of earliness for days to flower and intermediateness for number of leaves. Significant positive heterosis for leaf length, leaf breadth, plant height and cured leaf yield were also showed by the F₁ hybrids. Among the characters studied significant cytoplasmic effect for leaf breadth only was exhibited by those crosses which had virginia as one of the parents.

Agr. 730 Mannan. M. A. and M. Z. Alam. 1972. **Studies on the biology of cherooot beetle, *Lasioderma sarricorne* (Fabricius) (Anobiidae: Coleoptera) in Bangladesh.** M. Sc. (Ag.) Thesis. Bangladesh Agr. Univ. (MS). 101 p.

Lasioderma seviricorne (Fab.) is a major pest of Tobacco and its different products such as cherooot, cigar, cigar ate etc. in the store, godown and factory. Maximum breeding and

multiplications of the insect was recorded at their third and fourth generations during the month of June to October, the peak period of the pest. The oviposition period increased with the decrease of temperature. The death of the female followed shortly after oviposition. Average incubation period was recorded 5 days at 95°F. The length of larval and pupal period increased with the decrease of temperature. The males could live up to 16 days and 21 days and the female lived 21 and 26 days during summer and winter seasons respectively. Life cycle was completed in 35 to 47 days in the summer and 42 to 60 days in the winter.

Agr. 731 Bhuiyan, M. S. A. and M. Sanaullah. 1972. **Effect of different types of crosses in tobacco (*Nicotina tabacum L.*)**. M. Sc. (Ag.) Thesis. Bangladesh Agr. Univ. (MS). 77 p.

A comparative study was made with 4 varieties, 6 singles, 12 three-ways and 3 double-crosses for yield and 7 other yield contributing characters. The average performance of single-crosses for all the studied characters were best of all excepting for plant height, stalk diameter and leaf breadth. The three way crosses were superior than doubles and parents for yield, leaf areas, leaf-length and leaf breadth. A good agreement between the actual and predicted values of double crosses for almost all the studied characters were indicated. A significant correlation of yield with time of flowering and insignificant positive correlations with number of leaves per plant, area of leaf and plant height was recorded.

Agr. 732 Rahman, M. A. and M. Sanaullah. 1972. **Genetical analysis of some quantitative characters in tobacco (*Nicotiana tabacum L.*)**. M. Sc. (Ag.) Thesis. Bangladesh Agr. Univ. (MS). 76 p.

Three varieties of tobacco (*Nicotiana tabacum L.*) along with their three F₁ and F₂ hybrids were used to study heterosis, inbreeding depression, and heritability of time of flowering in days, number of leaves per plant, plant height, leaf length, leaf breadth, length of internode, and green weight of leaves. The experiment was conducted at the Bangladesh Agricultural University Farm, Mymensingh during 1970-71. The F₁ hybrids manifested significant heterosis for the characters time of flowering in days, plant height, leaf breadth, length of internode, and green weight of leaves. Inbreeding depression in F₂ of the studied characters were small and insignificant excepting the time of flowering, where the depression due to inbreeding was significant. The heritability of all the characters were very low and indicated that selection in F₂ would not be effective.

Oil Crops

Groundnut

Agr. 733 Alim, A. 1962. **Study of the effect of weeding and ridging on the yield of groundnut.** Proc. 14th Pakistan Sci. Conf. Abs. A. 104-105.

Groundnut is a profitable cash crop of East Pakistan. The cultivators have found a source of revenue in this new crop and wherever they grow it, they pay every attention to make it a success. As such the groundnut fields which become too much weedy in the Kharif season, are weeded out regularly though it is a very costly operation in these days of labour scarcity and, moreover, in some areas, the growers make ridges in groundnut cultivation incurring an additional expenditure with the contention of harvesting a better crop. The present experiment was designed with a view to studying whether weeding is essential and how far ridging helps to increase production of nuts. The work was conducted at the Dacca Central Research Station under a randomized block design during the kharif seasons of 1958-59, 1959-60 and 1960-61. The Departmental variety, Dacca No. 1 was used in the experiment with five replications and three treatment viz. (1) No weeding, no ridging, (2) weeding but no ridging and (3) weeding and ridging. The data obtained from this study reveal the occasional weeding is essential for the groundnut cultivation but ridging does not help increased production of nuts. The same results were obtained in all the three years.

Agr. 734 Khan, N. A. 1962. **Food wastes: part IV. Industrial prospects of groundnut wastes and products.** Proc. 14th Pakistan Sci. Conf. Abs. A. 60-61.

The general analyses of groundnut wastes, such as, groundnut hay, top coats, seed testa, immature waste fruits, kernel germs, and oil meals, have been carried out in assessing the values of their components. The mixture of groundnut hay, top seed coats, red seed testa, and immature waste fruits, has been found quite nourishing and milk-yielding as additive to multipurpose feed (mpf, paddy hay, pulse husk, inedible oil cakes and groundnut mixture : 1:3:5:1). The groundnut germs yield oil rich in tocopherols (vitamin E). The delicious groundnut meals have been successfully used for the purpose of preparing artificial milk and "Multipurpose Food" (MPF) for human consumption.

Agr. 735 Amanullah, M. and S. M. Hasanuzzaman. 1966. **Study on the megasporogenesis and fruit development of groundnut (*Arachis hypogaea* Linn.).** M. Sc. (Ag.) Thesis. East Pakistan Agr. Univ. (MS). 107 p.

The study was carried out in Agricultural Research Laboratory, Dacca, to study the morphology of flower, megasporogenesis, development of the female gametophyte; fertilization, fruit development and fruiting efficiency, groundnut plants flowered profusely but only a limited number produced mature fruits. The investigation was undertaken to study these and probable causes of failure to fruit formation. The flowers were born in spicate or

sub-paniculate inflorescences. They were pupilionaceous, complete and sessile. The ovule was hemianatropous, bi-tegminal and crassinucellar type. Usually chalazal megaspore functioned. Fertilization was porogamous. At the time of fertilization the embryo sac was found to contain the egg and the polar nuclei only. The endosperm developed was nuclear type. Two layered endosperm was found in the mature seed which contained two well developed cotyledons. The ovary after fertilization elongated into peg, grew geotropically, penetrated the soil and fruit development occurred underground. Development of the female gametophyte seemed to be normal and fertilization failed only rarely but 40 percent of the flowers failed to show any mark of ovary development. The low percentage of fruit formation was attributed to some kind of nutritional imbalance.

Agr. 736 Hussain, M. M. 1966. **Effect of preplanting sprouting, planting depth and method of planting on the yield and oil content of groundnut.** M. Sc. (Ag.) Thesis. East Pakistan Agr. Univ. (MS). 88 p.

A field experiment on groundnut was carried out in the East Pakistan Agricultural University Farm, Mymensingh to study the preplanting sprouting of seeds, planting depth and method of planting on the yield and quality of groundnuts. Highest pod yield was obtained from planting sprouted seed which was followed by shelled dry seed. Cracked pod produced the lowest yield. Yield of pods increased with increase in planting depths. The method had not any effect on the pod yield.

Agr. 737 Khaleque, M. A. 1966. **A study on the effect of spacing on the yield components of groundnut when cultivated in high land.** M. Sc. (Ag.) Thesis. East Pakistan Agr. Univ. (MS). 108 p.

An experiment was conducted at the Bangladesh Agricultural Institute Farm, during the period from February to June, 1965 to evaluate the effects of different row to row and plant spacings on some agronomic and yield contributing characters. Significantly higher number of branches per plant was produced at 20 inches row to row spacing. Highly significant effect of both row to row and plant to plant spacing were observed on the zone of maximum fruiting. A significant response on the green and dry weight of pods were also observed due to row to row and plant to plant spacing. At 20 inches spacing, yield was maximum. The pod weight was significant with 20 x 12 inches spacing. The spacing had no effect on oil, protein and carbohydrate contents of groundnuts.

Agr. 738 Rahman, L. and I. H. Khan. 1966. **A study on the effect of spacing, phosphorus and potash on the yield components and oil content of groundnut grown as a rabi crop.** M. Sc. (Ag.) Thesis. East Pakistan Agr. Univ. (MS). 141 p.

An experiment was conducted with different doses of phosphorus and potassium at different row-spacing on groundnut. The levels of row spacing were 10 15" and 20" and rate of phosphorus and potassium were 0, 20 and 40 lbs, per acre of P_2O_5 and K_2O respectively. The study revealed that the effect of row spacing on the yield and yield contributing characters

was significant. Total yields of unshelled, shelled, double and single seeded nuts per plot were highly favored by least row spacing i. e. highest plant density per unit area, while the reverse was true in case of yield contributing characters where wider row spacing (20 inches) was the best. Higher yield by highest plant density might be supported by the findings that should an increase of 0.016 lbs. of nut for the addition of 1 plant. Application of P_2O_5 was found beneficial for nut yield and number of double seeded nuts per plant. It was found effective increasing oil content but to a lesser extent than K_2O). Effect of potash singly or in combination with P_2O_5 was prominent in increasing oil content of groundnut kernel. The best interaction effect of P and K on total yield was 40, and 20 pounds of P_2O_5 and K_2O per acre, while the effect of phosphorus and potash interaction on oil content was 40 lbs. each of P_2O_5 per acre. 10 inches row width, 40 lbs. P_2O_5 and 20 lbs. K_2O in combination resulted the highest yield of 3758.26 lbs. nuts per acre. But the same row width 20 lbs. each of P_2O_5 and K_2O was found to be the most economic and which yielded about 3714.70 lbs. of nut per acre.

Agr. 739 Islam, M. A. and A. Alim. 1967. **A comparative study of the yield contributing factors of twelve different strains of groundnut (*Arachis hypogaea* Linn.)** M. Sc. (Ag.) Thesis. East Pakistan Agr. Univ. (MS). 62 p.

Twelve strains of groundnut were grown at the Agricultural Research Institute Sub-station, Pabna to study the yield contributing factors of groundnut, such as, number of pegs, number of pegs that developed pods, number of immature and mature pods per plant, etc. The interrelationship between some of the characters and percentages of carbohydrate, protein, oil, etc. were also found out. However, the study revealed that the strains P. I., No 14, Dacca No. 1. Spanish 146/H and No. 5814 were found to maximum number of pegs, pegs that developed pods, number of mature pods, etc. The positive and significant correlation coefficient were found in some of the character combinations. The maximum percentages of protein, oil, etc. were also found in the strains Spanish 146/H, No. 2. Dacca No. 1, etc.

Agr. 740 Khan, I. H. and L. Rahman. 1968. **Response of groundnut (*Arachis hypogaea* L.) to spacing and fertilizers.** 20th Pakistan. Sci. Conf. Prof. A 84.

From the study it was observed that a linear increase in yield of nuts obtained as the row width narrowed from 20 to 10 inches. Most of the yield components were favourably affected by wider row. The plant population per acre due to row-width played the important role in respect of yield of nuts per acre. The application of P at the rate of 40 lbs/a. of P_2O_5 significantly favoured the yield of nut per acre, and had beneficial effects on most of the other characters studied. Applied K had no significant effect on yield or other characters investigated. The best interaction effect of P and K on yield of nuts was due to 40 and 20 lbs/a. of S and K. Maximum yield of 3758.56 lbs/a. of nut was obtained wing to the combined effect of 10 inches row-width along with 40 and 20 lbs/a. of P and K respectively. But the same row-width along with 20 lbs/a. each of P and K was found most economic with the production of 3714.70 lbs. of nuts per acre.

Agr. 741 Rahman, L. and I. H. Khan. 1968. **Effect of phosphorus, potassium and row-width on the oil content of groundnut (*Arachis hypogaea* L.)**. Sci. Res. 5 (4): 221-225.

It was observed that the percent oil content was increased due to increased rate of both P and K, up to 40 lbs. per acre with positive linear response having $b=1.17$ and 1.77 for P and K respectively. These two factors increased the oil content both single and in combination. Variation in row-width showed no such beneficial effect on the oil content of groundnut, but influenced the yield significantly.

Agr. 742 Rahman. L. 1969. **Performance of groundnut varieties at different fertility levels**. Proc. 21st Annu. Pakistan Sci. Conf.

A variety cum fertilizer trial of groundnut was conducted at the East Pakistan Agricultural University during the period from November 1967 to April 1968. Seven groundnut varieties Viz. Da. I, No. 4, K-17, Natal-1, A-1-2, Starr and Spantex were tried at 0-0-0, 10, 10, 20, 20, 20, 40 and 30, 30, 60 NPK levels. Observation in respect of yield of nut per plot showed a significant different varieties under trial. The variety Da-1-a promising local recommended variety was found to produce maximum nut yield per plot. This was followed by variety K-17. The lowest yield was obtained with Starr a large seeded variety. Response of varieties to fertilizers were different. In most cases there existed a positive linear trend. In general, the fertilizer treatment showed a linear positive response with $b=.04$.

Agr. 743 Rahman. L. 1969. **Response of groundnut (*Arachis hypogaea* L.) to plant spacing and planting materials**. Proc. 21st Pakistan Sci. Conf.

An experiment was laid out during the period from November 1967 to April 1968 to evaluate the effect of various plant spacing and planting materials (sprouted and non-sprouted seeds) on the yield of groundnut. From the study it was observed that plant spacing or plant population have had profound effect on the yield of nut per plot. The least plant spacing (10" x 4") or maximum plants per acre (1, 56,816) produced maximum nut/a. The yield obtained with this spacing was about 83% more than that obtained with maximum spacing (15" x 12" or 34,848 plants) from the data it appears that 10" x 8" spacing produced 73% more nut over the control (15" x 12"). Planting material showed no significant effect on the yield of nut.

Agr. 744 Imam, S. A. and A. M. Shamsudin. 1970. **Effect of planting dates and ridging on three varieties of groundnut**. M. Sc. (Ag.) Thesis. East Pakistan Agr. Univ. (MS).

The experiment was conducted at the Agricultural University Farm, Mymensingh, during the period from May-November 1970. The three varieties, No.4, A₁₋₂ and Dacca-1 were planted on May 16, June 1, 16 and July 1 and were given the ridging treatments of no ridging, ridging at planting, ridging at flowering and ridging at pegging. The first planting date on My 16 was found best for groundnut production. Ridging operation was found to be definitely beneficial

for maximum production. Ridging at flowering was found best being closely followed by ridging at pegging. The three varieties were three morphological types of groundnut. No. 4 was an erect or bunch type, A₁₋₂ was a spreading or runner type and Dacca-1 was a semi-erect type. A₁₋₂ produced highest yield of pod to the extent of 3364 kg/ha when planted on May 16 and ridged at flowering.

Agr. 745 Rahman, L. and M. H. Ali. 1970. **A study of flowering habits in relation to yield in seven peanut varieties.** Pakistan J. Sci. 22 (5-6): 227-232.

Production of flowers in peanut varieties occurred in flashes. Fluctuations may be observed at a regular interval of mainly 10 days. Flower production continually increased up to 105th day. A curvilinear trend was obtained in subsequent day's interval up to harvest. Maximum number of flowers per plant was found to produce within 105-126 days of flowering. But period up to 95th day considered best for fructification. The varieties producing lower number of flower per plant and late gave minimum yield. Early and more flowers was found best for nut yield per acre, while late and more flowers was also favourable. Number of flowers produced per plant showed a positive relationship with the yield of nut/acre. The varieties (i) No. 4 (ii) Natal-1 and (iii) Spanish may be called early while (i) No.4 (ii) Natal-1, (iii) Spantex and Starr constitute the high flower producing crop at early time.

Agr. 746 Rahman, L. 1970. **Groundnut a promising oil crop in East Pakistan.** Pakistan J. Sci. 22 (3-4): 114-118.

Groundnut is a promising oil crop in East Pakistan. Agricultural factors of production are favourable for this crop. It can be cultivated in both the seasons. It contains about 42-53 percent of oil, and 30 percent of protein of the shelled nuts. It also contains vitamin A, C and D. It has also been observed that the per acre product value of groundnut at market price level is approximately 2.7, 2.9 and 3.0 times more than mustard, teal and linseed. For high yield a plant spacing of 12 x 6 inches should be considered best for this crop. The application of N, P and K fertilizers at the rate of 20, 40 and 40 pounds per acre of N, P₂O₅ and K₂O is to be made. Care should be taken against "Tikka" (leaf spot) disease.

Agr. 747 Saha, N. K. and A. A. A. Muhsi. 1971. **Effect of symbiotic nitrifying bacteria on groundnut (*Arachis hypogaea*).** M. Sc. (Ag.) Thesis. East Pakistan Agr. Univ. (MS). 46 p.

Influence of different factors such as nitrogen, calcium, organic matter and different strains of inoculum taken from different sources on groundnut was studied setting three different experiments in pot culture in the laboratory of East Pakistan Agricultural University, Mymensingh in 1968-69 season. The effect of these factors on nodule formation, growth of the plant, yield of plant and nutrient percent analysis of plant shoot was analyzed. It was noted that inoculum taken from cowpea (*Vigna sinensis*) produced better nodule formation, growth and yield of groundnut plant. Effect of calcium study showed that increase in calcium produced higher nodulation and growth of groundnut plant resulting in higher yield Addition of nitrogen to the field reduced nodulation and effective pod yield. Groundnut plants were

more effective in accepting nitrogen from nodulating bacteria than from artificial nitrogenous fertilizers and they could produce more fruit when nitrogen is received from nodulating bacteria. Addition of organic nutrient to the soil had no visible effect nor was any interaction effect. In all cases higher fruit formation resulted in absorption of nutrients from shoot whereby shoot analysis indicated lower percentage of nitrogen, phosphorus, potassium, calcium, and magnesium. The overall result showed that inoculum taken from cowpea be used to increase pod yield.

Agr. 748 Bhuiya. Z. H. and S. U. Chowdhury. 1973. **Effects of nitrogen, phosphorus, potassium and sulphur on the yield of groundnut grown in Brahmaputra floodplain soil.** Bangladesh J. Soil Sci. 10 p. (In Press).

A fertilizer trial on groundnut (*Arachis hypogaea* L.) was carried out during 1969 wet season in the Brahmaputra Floodplain soil of Bangladesh Agricultural University Farm, Mymensingh and was studied the effects of N, P, K, and S fertilizers and their combinations on the yield of groundnut. The N showed a progressive trend in increasing the yield but the effect was not significant. The N in combinations with other fertilizers also did not show any significant increase in yield. P, K, and S application too gave no significant increase in yield. S x P interaction, however, gave an increase in yield of groundnut which was significant at 5% level. Maximum yield was observed from single S application.

Agr. 749 Bhuiya, Z. H. and M. A. Wahhab. 1973. **Comparative performance of seven groundnut varieties under tropical climate (I) oil and protein content in the kernel and protein content in the root and shoot.** Bangladesh J. Agr. Sci. (MS).

The experiment was carried out with seven groundnut varieties to study the yield and yield components with respect to nitrogen, protein and oil content in root, shoot and kernel. The results showed the highest oil content in the kernel of stem (56.70%) and the lowest in Spantex (53.92%). The highest nitrogen and protein content were found in the shoot of Natal-1 but Dacca-1 and Spantex contained the lowest. Dacca-1 and Cox's Bazar contained the highest amount of nitrogen and protein in the root while the lowest amounts were found in Spantex and Spanish. The kernel analysis revealed that Dacca-1 topped the list in nitrogen and protein contents and lowest amount was found in No. 4. Correlations between oil content and shoot weight, nitrogen in kernel and in shoot weight were positive but not significant, while the relationship between shoot weight and nitrogen in root was positive and significant.

Agr. 750 Bhuiya. Z.H. and S. U. Chowdhury. 1973. **Effects of N, P, K and S on the protein and oil content of groundnut grown in Brahmaputra floodplain soil.** Indian J. Agr. Sci. 9 p. (In Press).

A field experiment was conducted in Bangladesh Agricultural University Farm, Mymensingh with three levels of nitrogen, two levels of phosphorus, two levels of potassium and two levels of sulphur to determine the protein and oil content of groundnut (*Arachis hypogaea* L.) kernel. Results revealed that the protein percent of groundnut kernel increased by the

application of N, P and S. Potassium application did not show any favourable increase in protein content of kernel. P, K and S application increased the oil content of kernel. No effect was observed with the applied N.

Agr. 751 Khan, A. R. and M. A. Wadud Mian. 1973. **In vitro screening of *Arachis hypogaea* against *Rhizoctonia solani* and *sclerotium rolfsii***. Indian Phytopathol. (In Press).

Eight varieties of peanut (K-17, NC-4X, Spanish N1-2, Cox's Bazar, Natal-1, No.4 and Dacca-1) were raised in sterilized and unsterilized soils infested with *Rhizoctonia solani* Kuhn and *Sclerotium rolfsii* Sacc. separately. High level of stand reduction was caused by *R. solani*. Disease development and stand reduction due to *S. rolfsii*, on the other hand, was negligible. With respect to plant height and dry weight of aerial and underground plant parts, the seedlings harvested from *S. rolfsii* infested soil did not differ from the seedlings of the same age harvested from non-infested soil. The present investigation rated the varieties Natal-1 and Dacca-1 to be less susceptible to those two pathogens.

Agr. 752 Momin, A. and M. A. Wadud Mian. 1973. **Pathological histology of peanut infected by *Rhizoctonia solani***. Bangladesh J. Bot. 2 (2): 55-60.

Sections through diseased roots of peanut (*Arachis hypogaea* L. var. Virginia) seedlings showed that *Rhizoctonia solani* Kuhn completely destroyed the cortex and degenerated the vascular tissues partially. The fungus also adversely affected secondary wood formation in the stelar region. *Rhizoctonia* infection in the hypocotyl did not extend deep into the cortex. The progress of the pathogen was evidently arrested by the development of a cork zone origination from a phellogen layer that appeared in the cortical zone of the cortical area. Mycelium of *R. solani* remedied through the infected tissues to root, hypocotyl and cotyledon both intercellular and intracellularly.

Mustard

Agr. 753 Alim, A. 1962. **Study on the performances of West Pakistan mustard in East Pakistan**. Proc. 14th Pakistan Sci. Conf. abs. A-104.

Of all the oilseeds mustard is by far the most important crop of East Pakistan and it is grown successfully throughout the province covering an area of 5 lakhs of acres. The production of mustard together with other oilseeds falls much short of the provincial requirement. So, with a view to achieving self-sufficiency in this commodity by way of possible extension of the present acreage and per acre yield of mustard, it is sometimes intended to supplement the present seed stock position of the improved varieties of mustard by importing good seeds from West Pakistan for immediate distribution to the growers at the sowing time. The results obtained that Raya L-18 is very poor in yield whereas Toria "A" which performed much better than Raya L-18 yielded about half of Rai-5. It concludes that West Pakistan mustards cannot be recommended for use as seed in the cultivator's fields on direct import.

Agr. 754 Joarder, O. I. and A. M. Eunus. 1968. **Inheritance of earliness and plant height in an eleven-parent diallel cross of *Brassica juncea***. Sci. Res. 5 (4): 200.

The inheritance of earliness and plant height in an eleven-parent diallel cross of *Brassica juncea* L. was investigated. On an overall basis, earliness and plant height were found to be controlled by both dominant and recessive genes but the contribution of the former was greater. Nineteen dominant factors were detected affecting plant height, whereas seven dominant factors were involved to condition earliness. Heritability was calculated to be 40-44 percent for earliness and 43-72 per cent for plant height.

Agr. 755 Joarder, O. I. and A. M. Eunus. 1970. **Inheritance of some quantitative characters in *Brassica campestris* L.** Pakistan J. Bot. 2 (2): 1-7.

The data collected for four quantitative characters have been analyzed by biometrical techniques. Estimates of K_1 indicate the presence of 1-2 effective factors, whereas those of K_2 suggested the presence of 4-14 effective factors operating for the characters studied. Presence of overdominance and complete dominance was observed in heading-to-ripening and sowing-to-heading period respectively, whereas in the remaining characters no dominance was noted. Transgressive segregation was indicated in both directions for all the characters.

Agr. 756 Eunus, M. and Hossain S. M. A. 1971. **Effect of planting method and seed rate on the performance of two varieties of mustard (*Brassica campestris* L. var. sarson and (*Brassica juncea* L. var. Rai).** Res. Rep. Dep. Agron. Bangladesh Agr. Univ.

Two varieties of mustard namely, Rai-5 and Sarson-9 were grown as broadcast and row-sown crop with four different seed rates of 4.59, 5.14, 6.89 and 8.04 kg/ha at the farm of the Bangladesh Agricultural University, Mymensingh during the period from October 1971 to March 1972. Sarson-9 produced significantly the higher seed yield than did Rai-5. Row seeding was proved to be better than broadcast seeding. Seed rates used ranging from 4.59 to 8.04 kg/ha did not produce any significant difference on the grain yield of mustard.

Agr. 757 Rahman, L. and M. Bechyne. 1971. **Methods of pre-breeding selection for oil content in *Brassica* species.** Oleagineux 26 (12): 773-778.

A suitable rapid micro-technique has been developed for quantitative determination of oil, to minimum quantity of 0.95 mg (one cotyledon of Brassica). The seeds of *B. juncea*, *B. hirta* and (*B. carinata*) show a high variability in oil content even when they have same specific gravity. In weight and oil content of kernel (*B. hirta* and *B. carinata*) the ratios between two cotyledons and hypocotyl, cotyledons separately and hypocotyledon and "half seed" were about 1:1, 1:1:2 AND 1:3 respectively. In weight and oil content of seed the ratio cotyledon: hypocotyl: seed coat was 2:2:1 and the ratio cotyledon: 'half seed': seed coat was 1:3:1. The specific gravity range of seeds of *B. napus*, *B. campestris*, *B. juncea*, *B. nigra* and *B. hirta* varied from 0.80 to 1.24 and that of kernel from 1.16 to 1.26. Large variations between the ranges, in seeds of *B. napus* indicated the presence of considerable air space in the seed.

Considerable variations in seed weight and oil content from seeds of the same specific gravity suggested the use of single seed, preferably the kernel, for determining the variability and use of “half seed” for breeding programme.

Agr. 758 Rahman, L. and M. Bechyne. 1971. **Notes on the selection for oil content through specific gravity method in oleiferous Brassica.** Proc. Oilseed Conf. Opava Czechoslovakia.

Results indicated that though the specific gravity had strong negative correlations with oil content of oil seeds, but the contribution of seed coat and airspace to seed played reasonable role against its full utilization. This is particularly true in case of seeds having wider range of specific gravity as is found in *B. napus*. But such consideration is not wholly true in other species where kernels and seed coat are so arranged that airspace is limited or even absent. Repeated selection through this method may give good result. Seed pre-selection had other advantages of improving the seed and capsule quality. Lower specific gravity per cent in 3 of 4 species (except *B. juncea* produced long size capsule. Kernels of all the species have very limited variations in specific gravity, so in species having seeds with wider range of specific gravity, selection of kernel may be more favourable. Though the progeny oil content was less than that of parents in *B. napus* and *B. hirta* but some were favourable for selection. Growing conditions have had much influence on the oil content but it does not invalidate the pre-selection of seeds through specific gravity method.

Agr. 759 Rahman, L. and M. Bechyne. 1971. **Variability in seed weight and oil content in single seeds of six Brassica species.** Proc. Oilseed Conf. Opava Czechoslovakia.

Seed weight of small size of all the 6 cultivated species of Brassica showed a narrow range of variability. But between size groups variabilities were more prominent, particularly where seeds were comparatively big. Variability in oil content was comparatively more in both small and big size seed groups. The variability might be due to differential structural development of seeds in those groups. All the correlation coefficients between seed weight and oil content in medium seed size group were negative. In some cases of small and big seeds some correlations were positive. On an average of the three/two sizes, the correlations were negative only with the exception of *B. nigra*, *B. hirta* and *B. juncea*.

Agr. 760 Rahman, L. and M. Bechyne. 1972. **Variability in seed weight, oil content and specific gravity as influenced by seed, pod and branch position on the plant of *Brassica carinata*.** Oleagineux 77 (6): 315-319.

Seed, pod and branch positions of *B. carinata* plants have a significant influence on seed weight, oil content and specific gravity of seeds from green house and field. In the first case, variability in seed weight for seed position was lowest and increased for pods and became highest for branch positions. Seed weight was negatively dependent on seed and pod position, but positively on branch position. In the latter case, variability in seed weight was minimum but significantly different. Seeds contained a considerably higher percentage of oil when they were taken from the base to centre of pod and of branch, and branches of central origin. Mean

oil content of seeds (32.68 p. 100) from field-grown seeds was almost equal to that of the seeds (32.68 p.100) from the green house. Generally, seed weight was negatively correlated with oil content but a few interesting positive correlations were also observed. About 57-71 p. 100 of seeds measure 1.0-1.22. Representative samples could be obtained from the base to the centre of the pod and branch and from the centre of the plant.

Agr. 761 Ali, H. M. and M. M. Karim. 1973. **A study on the effect of irrigation and nitrogen on the performance of mustard (RA1-5).** M. Sc. (Ag.) Thesis. Bangladesh Agr. Univ. (MS). 35 p.

An experiment was conducted at the field laboratory of the Department of Agronomy, Bangladesh Agricultural University, Mymensingh, during the period from October, 1972 to January 1973 to find out the effect of two irrigations and eight nitrogen treatment on the performance of the cultivar Ria-5 (*Brassica juncea*). The different levels of nitrogen per acre showed a significant effect on the plant height, number of primary branches and field pods per plant, number of seeds per pod, weight of pod, weight of seeds per plant, weight of plant and the yield of plant and the yield of seeds per unit plot. The effect of interaction of irrigation and nitrogen was found to be significant on the number of empty pods and the weight of seeds per plant. The number of field pods per plant increased with the increase in the amount of nitrogen per acre, the maximum being observed with 70 lbs. N per acre.

Agr. 762 Rahman, L. 1973. **Breeding for oil content and composition in Oleiferous Brassica.** Bangladesh Agr. Res. Council. (In Press).

In this review article the author has reviewed as many as 118 papers so far published in different countries of the world. Elaborate discussion was made on the variability, inheritance, and factors affecting oil content along with the methods of oil determination in relation to breeding. In the second part of it, the fatty acid composition of *Cruciferae* and *Brassica* seed fat and their quality problem were discussed. Relationships between major fatty acids, and their way of synthesis, variability inheritance pattern and factors affecting the compositions were elaborately discussed. The techniques of breeding for oil quality were also reviewed.

Agr. 763 Rahman, L. 1973. **Inheritance of erucic, eicosenoic, linoleic and oleic acid in *B. juncea* and *B. napus*.** Bangladesh J. Sci. Ind. Res. (In Press).

The pattern of inheritance of erucic, eicosenoic, linolenic, and linoleic and oleic acid contents of seeds oil was investigated in F_1 , F_2 and BCF_1 populations of interspecific cross made within the species of *B. juncea* and *B. napus*. The nature of inheritance of erucic acid was additive and a two-gene-pair system controlled its content. The eicosenoic acid content was controlled by the same two gene-pair system but the nature of action was dominant and recessive. The content of linolenic acid was found to be controlled by single dominant gene pair system. On the contrary, the linoleic acid content was though conditioned by one-gene-pair, but the nature of action was additive. Similar additive gene action was also observed in case of oleic acid, but the number of gene-pairs involved was two. The relationships between

erucic and eicosenoic acids were positive. The same between linolenic and linoleic was also positive. Oleic acid showed negative associations with all the other fatty acids considered.

Agr. 764 Rahman, L. 1973. **Inheritance of oil content in the interspecific levels of *Brassica amphidiploids***. Bangladesh J. Sci. Ind. Res. (In Press).

Two interspecific hybrids were raised after crossing *B. juncea* with *B. napus* and *B. carinata*. The pattern of inheritance of oil content was determined. In F_1 hybrids, in spite of the differences in the pollen donating parents and seed weight, the oil contents of both remained very close to each other; and in the case of F_2 , both the hybrids produced seed having average oil content of only 3.83 and 1.78 percent more than the material plant. Most of the F_2 seeds were near the maternal range of oil content. In the separate analyses, the F_2 seeds were found to contain only 1.83 and 2.57 percent more oil than maternal seed and the hybrids did not differ significantly in oil content. Prediction was made that the oil content in these Brassica seed oil was under the control of maternal sporophyte. Absence of clear cut segregation pattern indicated the polygenic control of the character. Seed weight and oil content was negatively correlated.

Agr. 765 Rahman, L. 1973. **Inheritance of erucic, eicosenoic, linoleic and oleic acids in *B. juncea* and *B. carinata***. Indian J. Agr. Sci. (In Press-).

The patterns of inheritance of erucic, eicosenoic, linolenic, linoleic and oleic and contents of seed oil was investigated in F_1 , F_2 and BC F_1 populations from the cross between *B. juncea* and *B. carinata*. The results indicated that the acids under investigations were controlled by gene action of same or different natures. Environmental conditions have had measurable influence of some acids, particularly when the content of the acid was high. In exacting the observations on the inheritance of major acids, it can be concluded that the erucic acid content was governed by single-gene-pair system with additive nature of action. For eicosenoic acid, the pattern was clearly the same as the erucic acid indicating the involvement of the same gene pair for both the acids. Similarly, though the linolenic acid content was conditioned by single-gene-pair system, but the nature of action was dominant (high value). In linoleic acid the number of genes involved remained the same, but the nature of gene action was additive. The pattern of inheritance of oleic acid in cross could not be ascertained.

Agr. 766 Wazuddin, M. and M.N. I. Talukdar. 1973. **To study the effect of phosphatic fertilizer at different seed rate on the yield of mustard (RA1-5)**. M. Sc. (Ag.) Thesis. East Pakistan Agr. Univ. (MS) 41 p.

A field trial was conducted in 1972-73 at Bangladesh Agricultural Institute Farm, Dacca to evaluate the effect of different levels of phosphatic fertilizer and seed rate and their interactions on the seed yield and other yield contributing characters of mustard (Rai-5) *Brassica Juncea*. Seed rate produced a significantly higher yield of seed. Superphosphate application resulted in a significantly increased seed yield and the highest yield being recorded with 80 lbs./acre and the seed yield decreased beyond and above this rate. The interactions of seed rate X superphosphate significantly increased the yield and weight of 100 seed.

Safflower

Agr. 767 Rahman, Q. N., N. Akhtar, F. Z. Majid and M. A. Salam. 1969. **Oil seed crops in East Pakistan. II effects of plant spacing on safflower.** Sci. Res. 6 (4): 177.

Safflower plants grown at 6 plant spacing were studied. 3" plant spacing was found to yield highest quality of oil, whereas oil content of seed was highest in broadcast system.

Agr. 768 Rahman Q. N., N. Aktar, F. Z. Majid and L. Nahar. 1969. **Oil seed crops in East Pakistan. III. Effects of date of sowing on safflower.** Sci. Res. 6 (4): 215.

Effects of date of sowing on safflower cultivation was studied all the year round Nov. 4, 1967-Oct. 19, 1968. The early part of November was found to be the best sowing period for the plant.

Soybean

Agr. 769 Islam, A. 1964. **The yield and chemical composition of soybeans as affected by three levels of complementary nutrients associated with five levels of phosphorus.** Pakistan J. Soil Sci. 1 (1): 32-49.

The use of triple superphosphate at rates up to 200 pounds of phosphorus per acre increased the dry weight of both leaves and stems. The yield of seed was significantly increased by the 200 pound application of phosphorus. The use of rates above this reduced the uptake of potassium which tended to be reflected in reduced seed yields. Phosphorus levels in both the leaves and the stems increased up to the flowering time and then decreased during the pod-filling period. Triple superphosphate applied to the soil at the rate of 400 pounds per acre of phosphorus significantly increased the phosphorus content of the leaves and stems. When less than 400 pounds, phosphorus levels in the tissue were not increased greatly but the treatment did contribute to plant growth and yield. The use of triple superphosphate resulted in creased accumulation of the divalent ions, calcium and magnesium. This was associated with a lower concentration of potassium. Differences in the accumulation of cations by soybeans are attributed to the morphology and physiology of the roots. The application of phosphorus increased the total sugar and alpha amino nitrogen contents of soybean plants. Phosphorus is thought to increase the efficiency of carbon dioxide utilization. In addition, this element is essential for phosphorylation reactions which could aid in the formation of alpha amino acids.

Agr. 770 Sheikh, A. Q., S. M. Ali and W. W. Worzella. 1966. **Effect of spacing and population on yield and other agronomical characteristics of soybeans.** Proc. Agr. Symp. 13-14 Atomic Energy Centre. Dacca p. 38-51.

The highest seed yields were obtained from Soybeans planted in rows spaced 25 and 50 cm. apart, while the lowest seed yield was derived from those planted in rows spaced 75 cm. Seed yield was not affected by the 2, 3 and 4 cm. within-row spacing. Spacing of rows to 50 cm. apart with 4 cm. in between seeds appears to be the most optimum from economical and

practical point of view. The variety Clark yielded the highest amount of seed. Soybean seed size was maximum when soybean plants were grown under wide spacing of both within and between rows in 1962 but not in 1963. The variety Clark produced the largest seed size among all the varieties studied. From the results it was concluded that seed size is a varietal characteristic and not much affected by conventional cultural practices. Plant height in soybeans was materially affected by spacing variations between and within rows. The tallest plants were obtained when the varieties were planted at 4 cm. X 75 cm. spacing and the shortest plants were obtained from spacing of 2 cm. X 25 cm. The mean plant height of the three soybean varieties in each group showed significant differences among them. Clark produced the tallest plants. There was no significant effect of within-row and between-row spacing on the number of seeds per pod in the soybeans. But the varieties of soybeans differed significantly for the number of seeds per pod. It was concluded that the number of seeds per pod is a varietal characteristic and is not changed much by variation of agronomical practices. Number of days from planting to flowering in soybeans was affected significantly by spacing both within and between rows. Even though the means are statistically significant, the differences due to various spacing treatments are so small that they have little practical application. The varieties showed differences among them.

Agr. 771 Rahman, Q. N., M. A. M. Chowdhury, F. Z. Majid and M. Atharuddin. 1969. **Oil seed crops in East Pakistan. I. Botanical and Chemical studies of some soybean varieties.** Sci. Res. 6: 172.

Nine varieties of soybean have been studied. One variety has been found to be superior to the other with respect to oil yield.

Agr. 772 Shaikh, M. A. Q. 1972. **Effect of population and spacing on the protein and the oil contents of soybean seeds.** Bangladesh J. Biol. Agr. Sci. 1 (2): 24-26.

Different plant populations of soybean varieties Ford, Perry and Clark were obtained by varying the within-row and between-row spacing and their effect was studied on the protein and oil content of the seeds produced. Row-widths and spacing between the seeds did not show any significant influence on the protein and oil content of the soybean seeds. There was, however, significant interactions of within-row x variety and within-row x between-row x variety on the protein content. But the advancement in percentages of protein in these interaction was very small.

Sunflower

Agr. 773 Khan, N. A., Q. N. Rahman and R. Ali. 1968. **Sunflower as oil seed crop in East Pakistan. II oil content of some local sunflower varieties.** Sci. Res. 5: 125.

Ten varieties of locally available sunflower seeds, from different sources, were analyzed for its quality in terms of oil content. Variety H-67-5a contained the highest amount of oil. The

seeds were quite large, the pericarp was thick. Variety H-67-3 was found to be most inferior in every respect.

Agr. 774 Khan, N. A., F. Z. Majid and M. A. Salam. 1968. **Sunflower as oil seed crop in East Pakistan. I Morphological and agronomic studies of some local sunflower varieties.** Sci. Res. 5: 118.

Seven varieties of sunflower plants, grown from five varieties of locally available seeds, were studied botanically as well as agronomical. The varieties studied, showed considerable variation to their morphological as well as agronomic characters.

Miscellaneous

Agr. 775 Khan, N. A. and B. K. Mondal. 1967. **Survey of oil seeds. Part I. some studies on the bazna fruits and seeds and their oils.** Sci. Res. IV (2 & 3): 117-124.

Bazna (*Xanthoxylum Budranga* Wall) fruits and its oil have been examined. Photomicrographs of transverse cross section of the fruit and the seed kernel have revealed interesting oil deposition in the same. The characteristic of the oil from pulp of the fruit and from seed kernel have been determined. The distribution patterns of fatty acids in both types of bazna oil through urea-complex fractionation have indicated the approximate composition of the fatty acid components.

Pulse Crops

Agr. 776 Shaikh, M. A. Q. 1970. **Morphological abnormalities detected in the M_1 generation of *Vicia Ervilia* and *Lathyrus* species flowering gamma irradiation of dry seeds.** Nucleus. 7 (3) : 183-189.

Air-dried seeds of *V. ervilia* and seven species of *Lathyrus* were irradiated with 2, 10, 15, 20, 25, 30 and 50 Krads of Co^{60} gamma-rays. The types of abnormalities observed in the M_1 generation were twin seedlings, stubby and severely damaged seedlings, seedlings showing loss of apical dominance, mottled and crinkled leaves, bifurcated leaves, bushy and small leaved plants, deformed and/or unfilled pods, black seed coat and black-and-white chimaeric seed coat colour. None of these variations bred true in the M_2 generation.

Agr. 777 Shaikh, M. A. Q., and M. B. E. Godward. 1971. **Radiation and genetical studies to estimate the number of embryonic initials taking part in the formation of the shoot meristem of *Vicia ervilia* and *Lathyrus sativus*.** Euphytica 20: 312-326.

Dry seeds of *V. revile* and *L. sativus* were irradiated with Co^{60} gamma rays. The M_1 plants were grown to maturity. During harvest, ten randomly selected plants were arbitrarily numbered (symbols P_1 to P_{10}) and the branches and the pod positions along each branch of each plant were numbered (symbols for branches, B_1 to B_4 and pod-positions, P_1 to P_5) from the lowest to the topmost one. The seeds of each pod-position were collected, threshed, counted and, the next year, sown separately. Mutants were isolated from among the M_2

population and each mutant could be traced back to the particular topography of the M_1 plant. The seeds from the M_2 plants originating from different sectors of the M_1 plants were grown to M_2 generation to study the pattern of inheritance. The segregation data of *L. sativus* show that in some cases at least one and in other cases at least two embryonic initials were involved in the formation of the shoot meristem whereas in *V. ervilia* the number of embryonic initials involved was at least two or three.

Agr. 778 Shaikh, M. A. Q., 1972. **Radiation induced mutants in *Lathyrus sativus* and their mode of inheritance.** Nucl. Sci. Appl. 6 (A): 17-22.

Air-dried seeds of *Lathyrus sativus* strain Barisal were irradiated with different doses of gamma rays. Mutants were isolated in the M_2 generation and their pattern of segregation was studied in the M_3 generation. The mutant types detected in the M_2 generation were narrow-leaved, dwarf, bushy and white flowered. The mode of inheritance differed in the different types of mutants. Possible use of each mutant has been suggested.

Agr. 779 Shaikh, M. A. Q. 1972. **Radiation sensitivity studies of *Lathyrus* species and *Vicia ervilia* (L) wild. L. dose-effects on germination and survival.** Nucl. Sci. Appl. 7 (A): (In Press).

Mature, dry and dormant (6-7% moisture) seed of seven species of *Lathyrus* and one species of *Vicia*, from the same season of harvest were irradiated with 5 to 50 Krad doses of gamma-rays (Co^{60}). The responses of different species within a genus and two genera of the same family to various doses of gamma-rays were studied in terms of percentages of germination of seeds and survival of plants at the end of the first, second and third week and at maturity. There was a continuous effect of increased radiation doses on the germination of seeds of all species, *V. ervilia* being the most radio resistant. Among the species of *Lathyrus*, *L. sativus* exhibited the highest radio resistance followed by the medium-sensitive group, *L. ochre's*, *L. tingitanus* and *L. clymenum* and the most sensitive group, *L. aphaca*, *L. sphaericus* and *L. nissolia*. With survival as an end point, *V. ervilia* and *L. sativus* revealed similar responses as in the germination tests but one species of *Lathyrus* showed inconsistent reaction; *L. sphaericus*, one of the most sensitive species, occupied the top position of the medium-sensitive group. The order of decreasing radio resistance among the remaining five species of *Lathyrus* were, *L. ochrus*, *L. ungitanus*, *L. clymenum*, *L. aphaca* and *L. nissolia*, the last one being the most radiosensitive of them all.

Agr. 780 Shaikh, M. A. Q. and M. B. E. Godward. 1972. **The meiotic consequences of radiation induced chromosome breaks in *Lathyrus sativus* and *Vicia ervilia*.** Cytologia 37 : 497-505.

Mature and dry seeds of *L. sativus* and *V. ervilia* were irradiated with 5, 10, 15, 20, 25, 30 and 50 Krad doses of gamma-rays (Co^{60}) and M_1 and M_2 plants were grown along with the controls. Meiosis of both the generations were studied to detect and explain the types of chromosomal abnormalities produced at different stages of meiosis in the M_1 generation and

that were subsequently still present in the meiosis of the M_2 generation. Meiosis in the control flowers of both the species was normal. The various types of abnormalities observed in the different stages of the M_1 generation were as follows: Diakinesis; heavy fragmentation of the nucleolus; metaphase I: univalents, tetravalent, multivalent, fragments, complex interchanges, rings, clumped and unusual configurations and orientated chromatin material forming a large, round and darkly stained mass when a few of the bivalents aligned at the equatorial plate; anaphase I: abnormal separation of the homologues, single and double bridges without fragments, anaphase I with laggards only, unequal numbers of chromosomes going to the poles; anaphase II: single bridges with or without laggards, anaphase II with laggards only, unequal volumes of chromatin material in daughter nuclei, unequal pollen grains, fused or twin pollen grains and very small pollen grains. In the M_2 generation, very few meiotic aberrations were observed in both the species. They were as follows in the different stages of meiosis; diakinesis: fragmentation of the nucleolus; metaphase I: complex interchanges and configurations, fragments, unorientated chromatin material; anaphase I: lagging chromosomes in anaphase I; anaphase II: laggards in anaphase II, and unequal volume of nuclear material in the daughter nuclei.

Agr. 781 Shaikh, M. A. Q. and M. B. E. Godward. 1972. **The mitotic consequences of radiation induced chromosome breaks in *Lathyrus sativus* and *Vicia ervilia*.** Cytologia 37 : 489-495.

The present study deals with the mitotic consequences of gamma radiation induced chromosome breaks in *L. sativus* and *V. ervilia* following seed irradiation. Various types of mitotic anomalies were encountered. These included: 1. Single, double, triple, multiple, X-shaped and interlocked bridges. The double bridges lasted very long persisting upto the late telophase and often the leaf pear-shaped projections in the daughter nuclei marking their positions. 2. Centric and acentric fragments in the metaphase and laggards in the anaphase were present. The fragments were of different lengths and the majority of them were in pairs. There were also some rings, minute deletions, dicentric chromosomes and chromatids present. 3. Unequal length of metaphase chromosomes showing much more variation in length than is observed in the normal karyotypes. 4. "Condensed" and "non-condensed" micronuclei in the interphase cells were observed and there was increasing evidence indicating that some of these micronuclei divide and go to the daughter nuclei. 5. Degenerated cells having little chromatin material and showing less stainability were present. 6. Giant cells having about double the size of the ordinary root meristematic cells were present only in the species. *V. ervilia*. Probable causes of the production of mitotic abnormalities following seed irradiation treatment were discussed in the light of the findings of other workers.

Agr. 782 M. A. Q. Shaikh. 1972. **Dose-effect relationship of gamma radiations as determined by chromosomal aberrations and nuclear damage in *Lathyrus sativus* L. and *Vicia ervilia* (L.) Willd.** Bangladesh J. Bot. 1 (1 & 2) : 65-74.

Dry seeds of two plant species, *L. sativus* and *V. ervilia*, were irradiated with 5, 10, 15, 20, 25, 30 and 50 Krad doses of gamma rays from a Co^{60} source delivering 5000 r per minute to

study the effect of radiation doses on the amount of chromosomal aberrations and nuclear damage produced in the somatic cells of their-root-tips and thus to establish the response patterns of these two species to radiation and their comparative radio-sensitivity. The mean number and percentage of anaphases with bridges and the mean number and percentage of anaphases with fragments increased in the root-tips of the irradiated samples of both the species over their respective controls. The increase was progressive with dose. The species *L. sativus* showed more chromosomal aberrations than *V. ervilia* in each of these parameters. The number of cells with micronuclei increased with dose in both the species more or less with similar frequency at lower doses but at higher doses *V. ervilia* root-tips produced larger number of cells with micronuclei than those of *L. sativus*. The root-tips of both the species, without showing any appreciable difference between them, registered a progressive increase in the number of degenerated cells and a steady decrease in the number of normal interphases and dividing cells with increase in dose. It was concluded from the results that *L. sativus* is more sensitive to radiation than *V. ervilia*.

Agr. 783 Shaikh, M. A. Q., 1972. **Radiation sensitivity studies of *Lathyrus* species and *Vicia ervilia* L. Willd. IV. Dose-effects on some plant characters.** Nucl. Sci. Appl. 6 (A): 9-16.

Dry seeds of seven species of *Lathyrus* and one species of *Vicia* were irradiated with 5 to 50 Krad doses of gamma radiation (Co^{60}). Both M_1 and M_2 populations were grown under controlled greenhouse conditions and dose-effects on some plant characters were studied. There was a decrease in plant height at maturity with increase in radiation dose in *L. tingitanus* and *L. clymenum*, no effect in *V. ervilia* and *L. sativus*, increase in *L. ochrus* and *L. nissolia* following 5 Krad and in *L. sphaericus* and *L. aphaco* following all doses at which last surviving plants were found. Pollen sterility percentages in both generations increased progressively with dose in all species over their control samples but in the M_2 generation the increase was much less than was observed in the M_1 . The percentages of sterile plants in *L. sativus* and *L. ervilia* increased in the treated samples in both the generations but the increase was not progressive with doses. Flowering and maturing were delayed in different degrees, in both the generations, depending on species and radiation doses.

Agr. 784 Rahman, M. S. 1973. **A study of the external morphology of fifty two varieties of cowpea (*Vigna sinensis*, (L.) Endl.** M. Sc. (Ag.) Thesis. Bangladesh Agr. Univ. (MS).

A comparative study of the morphology of 52 varieties of cowpea was conducted. The varieties exhibited great differences in the earliness of flowering, total length of stem, degree of branching, colour of the foliage and flower, number of pods per flower stalk, colour, length, circumference and average number of seeds per pod, time of maturity of the pods, shape, size and colour of the seeds. Most of these varieties may be identified by one or more of these characters. Brief descriptive information about each of these varieties have been presented.

Agr. 785 Shaikh, M. A. Q. and M. B. E. Godward. 1973. **Follow-up studies on the eliminations of aberrations due to seed irradiation with the development of shoot meristem.** Proc. 2nd General Congr. SABRAO, Feb. 22-28 (1973), New Delhi. 83 p.

Air-dried seeds of *Vicia ervilia* and *Lathyrus sativus* were irradiated with 5, 10, 15, 20, 25, 30 and 50 Krad doses of gamma rays (Co^{60}). The seeds along with the control were sown and the plants were grown in the greenhouse. Each pod or pods from each node were harvested, threshed, stored and counted separately. Mean number of seeds of branches B₁, B₂, B₃, and B₄ and in pod-positions B₁, B₂, B₃, B₄ and P₅ along each branch was calculated. Viability of seed from each was determined by germination tests. Ultimate height and seed yield of each M₂ plant were recorded. In general, as opposed to the control plants, the upper branches of the treated plants produced more seeds than the lower ones. Similarly, the upper pod-positions along each branch produced more seeds than the lower pod-positions; this tendency being more remarkable in the lower branches than in the higher ones. The seeds from the control plants of both the species, whatever the branches of origin, showed similar percentages of germination. But seeds collected from the upper branches of the treated plants showed higher percentages of germination than those of the lower branches. In the irradiated samples, there was a slight but consistent increase in the ultimate height and seed yield of plants and a decrease in variability in those characters with the upward shifting of positions of pods and branches. There was no such trend in the plants developed from control seeds whatever their place of origin in the branch and pod position hierarchy. In general, the results provided conclusive evidence that the M₁ plants have more normality in their upper than lower parts due to the elimination of aberrations with the development of the shoot meristem.

Agr. 786 Shaikh, M. A. Q. and M. B. E. Godward. 1973. **Radiation sensitivity studies of *Lathyrus* species and *Vicia ervilia* (L.) Willd. III. Dose-effects on yield components and seed yields per plant.** Proc. 2nd General Congr. SABRAO, Feb. 22-28 New Delhi, 68.

Air-dried seeds of seven species of *Lathyrus* and one species of *Vicia* were irradiated with gamma radiation (Co^{60}) doses of 5 to 50 Krads. The plants were grown under controlled greenhouse conditions. Plants were selected at random from each treatment including the control for studying the effect of radiation doses on some yield components and seed yields per plants. The species *L. sativus* and *V. ervilia* were also studied in the M₂ generation. The species different in their reaction to various doses of radiation. Following irradiation, there was decrease in number of pods per plant in two species but increase in six, decrease in number of seeds per pod in all the eight species; decrease in number of seeds per plant in six species but increase in two; decrease in 1000-seed weight in two species but increase in six and decrease in seed yield per plant in five species but increase in three. There was more variability in the irradiated samples (both M₁ & M₂ generations) than the controls and also more variability in the M₁ than in the M₂ generation. Suitable working dose for each species is suggested.

Agr. 787 Shaikh, M. A. Q. 1973. **Radiation sensitivity studies of *Lathyrus species* and *Vicia ervilia* (L.) Willd. II. Dose-effects on seedling heights during the first three weeks of plant growth.** Nucl. Sci. Appl. 7 (A): (In Press).

Experiments were designed to determine the relative radio sensitivity of seven species of *Lathyrus* and one species of *Vicia*. Dry seeds (6-7% moisture) were irradiated with 5 to 50 Card dose of Co^{60} gamma rays. Seed germination and seedling growth operations were carried out under greenhouse conditions. Seedling heights were measured daily as an end point for 14 days from the first day of germination followed by a final assessment on the 21st day. The results indicated that seed irradiation may retard or stimulate seedling growth depending on species and radiation dose. The eight species could be arranged in the following order of most retarded to most resistant: *L. ochrus*, *L. clymenum*, *L. tingitanus*, *L. aphaca*, *L. sativus*, *L. nissolia*, *L. sphaericus* and *V. ervilia*, the first five being retarded and the last three being stimulated. Reduction of total seedling height among the adversely affected groups also varied depending on species and radiation dose. The faster growing species exhibited extreme arrest of growth even at lower doses as compared to the slower growing ones of the same genus. Similarly, among the stimulated group, the enhancement of seedling growth resulting from seed irradiation with lower doses varied in degree according to species. As an endpoint to determine radio sensitivity, the usefulness of daily recording of seedling heights for an extended period during the early life of the plant as opposed to only one assessment at a particular growing stage is discussed.

Sugar crops

Sugarcane

Agr. 788 Ishaque, M. 1962. **Effect of preplanting fungicidal treatment of setts upon emergence and yield of sugarcane.** Proc. 14th Pakistan Sci. Conf. Abs. A-61-62.

Like many other planting materials, sugarcane setts carry some disease incitants. Activities of these as well as those of the soil-borne ones account for the sett-rot and the poor ununiform stand of the seedlings. Plots with gappy stand, thinner population and many unhealthy seedlings give poor yield. With a view to controlling the seed-borne and soil-borne disease incitants experiments were conducted during the period 1957-60 at the Sugarcane Research Station, Ishurdi, East Pakistan in which the effect of copper, organomercurial and quinone group fungicides were tested. The results showed that the emergence and seedling stand increased significantly due to preplanting fungicidal treatments of setts. Maximum increase (56%) was obtained due to the use of a formulation of organomercurial fungicide. The quinone preparations were next best (35% increase).

Agr. 789, Alam, M. Z. 1965. ***Eoeurysa Flavocapitata* Muir (Dil-Phacidae : Hemiptera), A New Pest Of Sugarcane In East Pakistan.** Proc. 17th Pakistan Sci. Conf. Karachi.

A black delphacid hopper, *Eoeurysa flavocapitata* Muir was first reported in East Pakistan in May, 1963 infesting sugarcane crop in the district of Rajshahi. The insect was also found in Dacca Farm on sugarcane. The hopper has not been recorded from India or Pakistan before as a pest. It has been detected as a major pest causing a serious infestation on sugarcane crop sucking sap from leaves. It has near resemblance to the genus *Tropidocephala*, super family Ful-goroidae under the family Delphacidae. The seasonal habits and external morphology of the insect have been studied.

Agr. 790, Chowdhury, A. J. M. E. H. 1965. **A Study On The Germination And Tillering Habits Of Six Selected Varieties Of Sugarcane.** M. Sc. (Ag). Thesis. East Pakistan Agr. Univ. (MS). 87 p.

A field experiment was conducted in the East Pakistan Agricultural Research Institute, Dacca to observe the germination and tillering habit of 6 selected varieties of sugarcane. Significant varietal difference in respect of germination of setts, production of tillers and shape of tillering among the varieties were observed. The variety 1-22⁷/₅ is likely to produce the maximum number of millable canes followed by 1-31/53, 1-31/54, Co.527, BO. 14 and Co.633.

Agr. 791, Khan, D. U. 1965. **Preliminary Trials With Folith-Ion, Lebaycid, Dipterex and Foli Dol M Against Top Borer of Sugarcane.** Proc. 17th Pakistan. Sci. Conf. Abs. A-30-31.

Folithion (0.15%). Lebaycid (0.15%), Dipterex 80% SP (0.125%), Dipterex Granules (10 lbs. per acre) and Folidol M 50 (0.1 %) were tried against sugarcane top borer in Thakurgaon Sugar

Mill area in East Pakistan. The plan of the experiment was randomised and replicated thrice. There were six plots including control in each replication. The size of the plot was 21 x 21 feet (approximately 1/100th of an acre). The insecticide was sprayed with the help of a hand knapsack sprayer. Observations were recorded after 24 hrs. 48 hrs. and 72 hrs. of treatment by examining ten affected tillers from each plot taken at random. The data collected shows that Dipterex 80 % SP when sprayed in the concentration of 0.125 % gave 82% mortality of borers after 24 hours of treatment while Dipterex granules, Lebaycid and Folithion gave 47%, 35% and 12% mortality, respectively. Folithion, however, gave 100% control of borers after 72 hours of treatment.

Agr. 792, Khan, D. U. 1965. **Further Trials With Fouthion, Lebaycid And Dipterex Against Sugarcane Borer (*Ch/L0 Sp.*)**, *Proc. 17th Pa'cistan. Sci. Conf. Abs. A-31*.

An experiment was laid out in Sheta-bganj Sugar Mill area in East Pakistan for the control of sugarcane borer (*Chilo sp.*) with Folithion 50% EC, Lebaycid 50% WP and Dipterex 80% SP each in the concentration of 0.25 %. The plan of the experiment was randomised and there were 4 replications. The insecticides were sprayed with a hand knapsack sprayer. Observations were recorded after 24 and 48 hours of treatment by examining the tillers of two plants taken at random from each plot. The data collected shows that Dipterex 80% SP resulted in 100% mortality of borers after 24 hours of treatment while Folithion 50% EC gave 95.5% and 100% and Lebaycid 50% WP gave 60% and 80% kill of borers after 24 hours and 48 hours, respectively.

Agr 793, Ahmed, M U. 1966. **A Study On The Effect Of Pre-Treatments Of Sugarcane Setts.** *Al. Sc. (Ag). Thesis. East Pakistan Agr. Univ. (MS). 84 p.*

An experiment was conducted to study the effect of different pre-treatments of sugarcane setts on cane and sugar yield and some other yield components. The results of the experiment indicate that all the pre-treatments were superior to control in respect of all the characters studied except height, The chemicals proved themselves to be superior to the others. Agallol₃ 0.75 % soln. appeared to be a good treatment material for the rate of germination, total germination, millable canes and cane yield, etc. The soln. Agallol₃ 0.5% was best for prevention of disease infes-tance.

Agr. 794, Alam, M.Z.1967. **Insect Pests Of Sugarcane And Their Control.** *Proc. E. P. Seminar on sugarcane Res. & Dev. Gopalpur; Rajshahi.*

Sugarcane is a very important cash crop in East Pakistan but her average per acre yield is very low and insect pests are one of the reasons for the low yield. Eight differnt insects and one mite cf major importance have been described. Their nature and extent of injury have been enumerated. Control measures based on field trials have been recommended.

Agr. 795, Alam, M. Z. and S. Alam. 1968. **Field Tests With Granular Insecticides For Control Of Sugarcane Borers In Comilla.** *Proc. 20th Pakistan Sci. Conf. Dacca.*

In tests conducted in Comilla in 1966, good control of sugarcane top borer, *Scirpophaga* spp. and stem borer, *Argyria tumidicostalis* H. was obtained with granular formulation of Diazinon 5G and Sevidol₇ at the rate of 30 lbs. in first two treatments 35 lbs. for third and fourth treatments and 40 lbs. for fifth and sixth treatments per acre. The first treatment started in May and the successive treatments were applied at an interval of one month ending the sixth treatment in October. The granules were applied at the top of the plants and some of the granules were received by leaf sheaths and the rest fell down on the ground. In order of their effectiveness Diazinon was found most effective and Endrin was superior to Sevidol in minimizing the infestation compared with that of untreated plots. Plots with moisture contents showed more promising effect than the plots with lowest moisture in the soil.

Agr. 796, Alam, M. Z. and I. I. Azim. 1968. **Notes On The Effect Of Soil Insecticides, Dieldrin, Heptachlor And Chlordane Against White Ants On Sugarcane Setts.** *Proc. 20th Pakistan Sci. Conf. Dacca.*

Experiments were conducted with soil insecticides, Dieldrin, Heptachlor and Chlordane against soil insect, white ant (termite) of Savar Rice Research Farm, Dacca in 1967. Four different dosages viz., 2, 1.5, 1 and 0.5 pounds active material per acre of Dieldrin and Heptachlor and three dosages viz., 2, 1.5 and 1 pounds active material of Chlordane per acre each replicated three times were used. Twelve sugarcane setts were planted in each replication plot of 3' x 12' size. A set Of control (untreated) plots was also

Sugar Crops in the experiments. Large number of white ants extracted from white *ant* nests were placed on sugarcane setts planted in the plots. The treatments of insecticides were applied on the following day after planting the setts. Infestation and damage observed on the setts 30 and 60 days after treatments were recorded.

Agr. 797, Kabir, S. M. H. and M. Rahman. 1968. **Field Tests Of Insecticides Against Sugarcane Top Shoot Borer In East Pakistan.** *PANS, A. 14 : 525-527.*

Azodrin and Sumithion acted rather quickly, and showed a mortality percentage of 90 and 80 respectively, within three days. However, there was no significant difference between Azodrin, No-gos and Diazinon on the tenth day. Car-bicron and Birlane showed poor result in controlling sugarcane top shoot borer.

Agr. 798 Alam, M. Z. and M. Abbas. 1969. **Notes On The Effect Of Soil Insecticides, Heptachlor And Agritox Against White Ants On Sugarcane Setts.** *Annu. Rep. Div. Entomal.*

Experiments were conducted with soil insecticides Heptachlor and Agritox against soil insect, white ant (termite) at Savar Rice Research Farm, Dacca in 1968. 2 pounds active material of Heptachlor per acre and two dosages, viz., 3 and 5 pounds active material per acre of Agritox each replicated three times were used. Twelve sugarcane setts were planted in each replication plot of 3' x 12' size. A sett of control (untreated) plot was also in the experiments. Large number of white ant nymphs collected from the white ant termitaria were inoculated on each sett planted. Next day after inoculation insecticidal treatments were applied. Post treatment data on the infestation and damage of setts by white ants were observed 15, 30, 45 and 60 days after treatments and data were recorded. The data revealed that Heptachlor 2 pounds active material per acre showed infestation upto 20.35 % and the Agritox used at the rate of 5 and 3 pounds (active material) per acre showed infestation upto 43.3 % and 54.69% respectively. Whereas the control plots showed infestation upto 85.25%.

Agr. 799, Quddus, M. A. and M. S. Ali. 1969. **A Study On The Effect Of Nitrogen And Potash On The Juice Quality Of Sugarcane.** *Pakistan J. Soil. Sci.* 5 (1) : 26-31.

A study was undertaken to see the effect of nitrogen and potash and their interaction on the quality of Sugarcane juice and the ultimate yield of Commercial Sugar per acre. 1. Nitrogen did not show any effect on the quality of juice i.e. Brix, Juice Purity per cent, Juice Sucrose per cent and Next Recovery per cent of cane. It only influenced significantly the yield of Commercial Sugar per acre.

2. Potash showed a definite and significant influence on both the juice quality i.e. Juice Purity per cent, Sucrose per cent, and Next Recovery per cent and the ultimate yield of Commercial Sugar per acre. The combined effect of N x P on any of the above characters is not worth mentioning. 3. In conclusion, it can be emphasized with some stress that when Sugarcane is grown in the Red Soil Tract of East Pakistan a considerable importance should be given on potash to obtain good quality cane juice which mainly contributes to the ultimate yield of Commercial Sugar per acre. More research is to be done in this line before making any definite recommendation.

Agr. 800, Elahi, M. A. and N. N. Sarker, 1970. **Study Of Press Mud As Medium For Raising Seedlings From Sugarcane Fluffs.** *Pakistan. J. Sci.* 22 (3 & 4) : 107-211.

The utility of the press mud in medium for raising sugarcane seedlings has proved most encouraging in comparison with farmyard compost previously used at the Research Station. Results of the experiment reveals that the press mud at the proportion 2:2: 1 (Press mud : soil : sand) seem to be an ideal combination for raising seedlings from sugarcane fluffs.

Agr. 801, Rahman. A. K. M. M. and S. M. H. Kabir. 1970. **Observation On The Seasonal Infestation Of The Sugarcane Top Shoot Borers In East Pakistan.** *Pakistan J. Sci. Ind. Res.* 12 : 312-312.

At least two species of top shoot borers, *Scirpophaga monostigma* Zeller and *S. auriflua* Zeller (Pyralidae: Lepidoptera) attack sugar cane in East Pakistan. They are most serious pests and are rather common in all district of the province where sugarcane is grown. The young sugarcane plants are most easily affected. During monsoon (May-July) the average percentage of infestation was 3.50. Field infestation increased to its peak during the month of August when an average of 14.13% infestation was recorded. In the months of September and October the infestation was also significantly high showing an average of 9.26 %. However, with the fall of temperature in November and December the incidence of infestation was reduced. Four hymenopterous parasites *Tricogramma* sp., *Shirakia jokohamensis* (Cam.), *Elasmus zehntneri* Ferr. and *Melcha* sp. were found to parasitize top shoot borers.

Agr. 802, Rahman, M. 1970. **The Effect Of Time Of Planting Of Sugarcane On Insect Attack And Yield.** *Proc. 21st and 22nd Pakistan. Sci. Conf.* 58.

The cultivators generally plant the sugarcane sets in the month from November to February. An experiment was set up to study the effect of the time of planting on the insect attack and also on the yield. The experiment was set up in 6 x 4 randomised block design. Sugarcane sets of variety 1-227 were planted in the 4th week of each month from September to February. It has been observed that the attack of insect was the lowest in the plots planted in January and February. The plots planted in September, October and November were attacked thrice by the top-shoot-borer, whereas those planted in December were attacked twice. The plots planted in January and February were attacked only once. The yield figure shows that plots planted in October gave the highest yield, It was 2129 mds. per acre. It was followed by November planting. Plots planted in December gave the third highest yield. This was followed by those planted in September, January and February respectively. The paper gives detail of the experiment and discuss the probable reason of such variation in insect attack and yield.

Agr. 803, Rahman, M. 1970. **Varietal Trial Of Sugarcane Against Pest Attack.** *Proc. 21st and 22nd Pakistan. Sci. Conf.* p. 59.

A number of varieties of high yield of sugarcane has been recommended by East Pakistan (now Bangladesh) Agricultural Department. An experiment was set up to study the relative resistances of some high yielding varieties. The experiment was in 5 x 5 Latin square design. Five varieties, such as PR-1000, Co-1158, Co-975, B0-32 and B0-34 were planted in the 1st week of November, 1967. There was little infestation in all varieties. The infestation by top-shoot-borer, *Scirpophaga* sp. was observed in the 2nd week of March and again in June, July and August. The Stem borer, *Chilo tumidicostalis* was found to attack sugarcane only once, in the 1st week of August. Some plots of the varieties Co-1158 and Co-975 were attacked by the leafhopper, *Eoerysa flavicapitata* M. This Delphacid bug attacked in the months of July to September. The yield shows that Co-975 gave the maximum yield. It is 2350 mds. per acre. PR-1000 have a yield of 1900 mds. which was the lowest.

Agr. 804, Rahman, M. 1970. **Integrated Control Of The Sugarcane Top-Shoot-Borer, *Scirpophaga* Spp. In Rajshahi Region.** *Proc. 21st-22nd Pakistan. Sci. Conf.* p. 58.

The top-shoot borer is the most destructive pest of sugarcane in Rajshahi region. A research programme was undertaken in August, 1967 to find out how effectively it can be controlled. During the last years experiment it has been observed that the larval stage of this pest is attacked by six different parasites. The parasites, however, could not be identified and they have been sent to the Commonwealth Institute of Entomology for identification (all of them have been identified at a later stage). The parasites are active from the month of June and by the end of August they kill upto 25% of the pest larvae. It has been observed that if systemic insecticides of short residual toxicity are sprayed during the month of July, the combined effect of the parasites and insecticides keep down the population of the top-shoot borer at such a low level that no further application of insecticides is necessary before harvest. The paper gives a detail description of the experiment.

Agr. 805, Ahmed, H. U. and A. K. M. Shahjahan. 1973. **Screening Of Major Varieties Of Sugarcane Against Red-Rot.** *Bangladesh J. Bot.* 2 (2): 61-65.

The screening of six major varieties of sugarcane against red rot was done under field condition at Dewanganj, Bangladesh, with a virulent isolate of *Colletotrichum falcatum* Went. Two varieties Co 1158 and ISD-4/55 were resistant, Co640 and B017 intermediate and B032 and ISD-5/95 susceptible.

Agr. 806, S. M. H. Kabir and M. H. Khan. 1973. **Insecticidal Test Against The Sugarcane Top Shoot Borers.** *Bangladesh J. Zool.* 1 (1) : 83-88.

Three organophosphorus insecticides, Azodrin, Bidrin and Gardona were evaluated in the field as foliar treatments for control of sugarcane top shoot borer (*Scirpophaga* spp.). Gardona gave the best control, while Azodrin caused highest inter-node mortality of the borers.

Agr 807. Eunus, M. and M Nasiruddin. 1973. **Effect of Various Depth of Planting of Different Types of Setts of Two Cultivars of Sugarcane on The Yield of Cane And Sugar.** *Res. report. Dep. Agron. Bangladesh Agr. Univ.*

Two type of setts-Thick (3.0-2.5 cm diameter) and thin (2.4-1.1 cm diameter) of two sugarcane cultivars namely, 1-2/54 and 1-5/55 were planted maintaining depths of 6", 9", 12" and 15" during the period from February through December, 1973 at the Farm of Bangladesh Agricultural University, Mymensingh. The cultivar 1-2/54 produced significantly the lower number of tillers/clump but higher number of millable canes and higher cane yield/ unit area than did 1-5/55 cultivar. Neither types of sett nor any depth of plantations.

Sugar Crops under study showed significant effect on the cane yield/unit area. Although 9" depth of plantation tended to give increased percentage of germination and increased number of millable canes/unit area. Yet it was identically followed by 12" and 6" depth of plantation for those characters. The production of tillers/clump increased significantly with the decrease in depth of plantation. None of the characters under study except the number of millable canes/unit area was affected by any interactions of treatments. The cultivar 1-2/54 coupled with thin sett and 9" depth of plantation gave the highest number of millable canes/unit area. None of the treatments under study showed any significant effect on cane height, cane diameter and cane sucrose content. However, the highest sucrose content was associated with the treatment 1-2/54 x thin sett x 9' depth of plantation leading to higher recovery percentage.

Agricultural Economics

Credit and Cooperatives

Agr. Econ I Husain, A. M. Muazzam. 1964, **A Model Cooperative Organization for Agricultural Development in East Pakistan.** *Ph. D. Thesis. Texas A & M University.* 167p.

The study was aimed at presenting a model co-operative organization for agricultural development in East Pakistan based on an investigation of the merits of the co-operative organization in selected countries including India, Japan and the U. S.A. and on the past experiences of East Pakistan especially those of the Comilla project. A three tier model co-operative organization was proposed for East Pakistan as a comprehensive and coordinated approach to tackle the various problems of its farmers, to help increase their production and income and thereby aid the process of agricultural development in the area. It was also proposed to incorporate the Agricultural Development Bank and the Agricultural Development Corporation within the framework of the new comprehensive co-operative set up in the long run. Recommendations were made to make the co-operatives grow out of the genuinely felt needs of the farmers and to insure their sound operation and efficient management for raising the production and income of the agricultural producers of East Pakistan.

Agr.Econ. 2 Hoque, N. 1967. **An Analysis of the Effectiveness (Adequacy) of Agricultural Credit Provided by the Agricultural Development Bank of Pakistan to Some Case Studies.** *M. Sc. (Ag. Econ.) Thesis. East Pakistan Agri. Univ.* 98 p.

Fifty ADBP loanees selected from two unions in the districts of Dacca and Comilla were studied. Total holdings per family averaged 6.54 in Comilla and 7.89 acres in Dacca which provided to support to the hypothesis that larger farmers had relatively more access to institutional credit. About 60-80 per cent of these loanees were also indebted to other non-institutional sources. About 40 per cent of the families had to disinvest assets to meet additional credit need. ADBP credit was utilized more for productive purposes as compared to credit from other sources. Friends and relatives appeared as the most important non-institutional source of credit. While land was the most common security for ADBP loan, no material security was provided against non-institutional credit. The credit security ratio for ADBP loan was 1110 or more which is rather high. Recovery rate was less than 20 per cent in both the unions.

Agr.Econ. 3 Hossain, M A. 1967. **A Study of the Utilization of Agricultural Credit in Some Area of a Rural Development Project (Gouripur Thana) in East Pakistan.** *M. Sc. (Ag. Econ.) Thesis. East Pakistan Agr. Univ.* 156 p.

Fifty member-farmers selected from 14 primary Agricultural co-operative societies were studied. About 94 per cent of the farmers were indebted to one or the other source. 72-74 per cent were indebted to all the institutional and non-institutional sources. About 40 per cent of the credit was provided by the institutional sources, mostly by co-operatives. Less than 20 per cent of the total credit need was satisfied by the existing sources. 40 per cent of the total credit was spent for family expenditure followed by capital expenditure on farming (32%) and current expenditure (10%). Long term loan repayment capacity of an average size holding was poor because of low income. The combined saving and credit programmes undertaken by the co-operative societies was expected to improve the repayment capacity of the member-farmers. Small farmers were yet to be benefitted from the loan provided under the rural development programme, but it was expected that they would gradually be motivated to take advantage of the opportunity created by this programme.

Agr.Econ.4Bashar, M. A. 1968.**An Analysis of the Present Agricultural Credit Structure in Some Selected Areas in Mymensingh District.***M. Sc. (Ag. Econ.)Thesis. East Pakistan Agr.Univ. 196 p.*

Selected farms from two villages were studied to determine how far the present agricultural credit organizations were adequate to meet the genuine credit needs of the farmers with determination of credit needs and pattern of utilization. Institutional credit was insignificant. All possible non-institutional sources provided credit to the farmers of which friends and relatives supplied the largest amount of loan during the year of study. Nearly one-quarter of the surveyed families had outstanding debt ranging from Taka 100 to Taka 249. Only half of the total credit need was satisfied by the existing sources and the rest was either met from dis-investing assets or remained unsatisfied. Nearly fifty per cent of the credit was used for meeting various items of family expenditure.

Agr.Econ. 5Azad, M. M. H. 1971.**An Analysis of The Effects of Land Tenure System on the availability and use of Credit in some selected areas of Mymensingh District.***M. Sc. (Ag. Econ.)Thesis East Pakistan Agr.Univ. 113 p.*

Fifty farmers, falling in four tenure classes, e. g. tenant operators, owner-cum-tenant operators, owner operators and owner operator-cum-landlords from two villages, Boyra and Sutiakhali under Kotwalithana of Mymensingh district were studied with the objectives of describing the existing land tenure system along with the determination of total credit needs of the farmers and the influence of land tenure on the availability and use of credit by the farmers. Average size of land holdings of the tenant-operators was much smaller than that of the owner operator and owner-cum-tenant operators. The average income was also found to be much below the income of other tenure classes. 100 per cent of tenant operators, 85.71 per cent of tenant-cum-owner operators, 83.33 per cent of owner operators and 33.33 per cent of owner operators-cum-landlords had outstanding debt mostly with non-institutional sources. Rigid terms and complex procedures practiced

by credit institutions stood against the incentive for borrowing. Loan has been suggested to be distributed not on the basis of creditworthiness but on the principle of effective production plan of the borrowers.

Agr.Econ. 6, Khaleque, M. A. 1972.**An Economic Study on the Working of Union Co-Operative Multipurpose Societies in Sadar South Subdivision of Mymensingh District.***M. Sc. (Ag. Econ.)Thesis.Bangladesh Agri. Univ. 101 p.*

Fifteen union co-operative multipurpose societies were studied to ascertain extent to which co-operative principles were adopted in the organization, operation and management of the societies and factors affecting their financial success or failure. The study revealed that inefficiency in the management and operation of co-operative societies resulted from the lack of understanding of co-operative principles, poor participation in financing societies. Shortage of capital, inadequate volume of business, lack of proper savings programme and the dearth of training facilities for the members of the managing committee.

Agr.Econ. 7Kutubi, M. A. F, 1972.**A Study of Utilization and Repayment of Agricultural Credit Provided by a Village Cooperative Society in Ktcc, Comilla, Bangladesh.***M. Sc. (Ag. Econ.) Thesis Bangladesh Agr. Univ. 74 p,*

Out of 300 village Agricultural Cooperative Societies in Kotwali Thana Central Cooperative Association under Corn-ilia approach, one society was selected for study with the objectives of determining the actual pattern of loan utilizations including the determination of credit need, adequacy of credit obtained and the payment capacity of the farmers. It was observed that cooperative society under KTCCA was the major important source of credit and the average amount of loan supplied by this institution was estimated at Rs. 1216.12 per year. 42.23 per cent of the total loan advanced to the Cooperative members was spent for capital expenditure which included -purchase of livestock, loan release, purchase of machinery, land improvement and purchase of land. The study revealed that 93.41 per cent of the total credit need of the farmer was met by the institutional sources, 5.64 per cent was met by disinvestment of the farmer's assets.

Agr.Econ. 8 Ali, M. H. 1973.**Fishermen's Co-Operatives in Bangladesh-an Economic Analysis.***M. Sc. (Ag. Econ.)Thesis Bangladesh Agr.Univ. 152 p.*

The study was undertaken during 1969-70 to observe organizational, management, financial, operation and other economic aspects of the fishermen's co-operatives in Bangladesh and to test various hypotheses related to the performance of the societies and two per cent members from each society were selected at random for the study. The study revealed that on the organization of the society some basic factors which led to the setting up of viable fishermen's co-operatives including economic needs were not considered at the time of forming the societies. The common members of the societies were not

convinced about the necessity of such an organization and also were not acquainted with the principles of co-operation. The management of the societies exposed many of their shortcomings. Management was largely weak and inefficient. All the societies suffered from internal capital shortage due to insufficient member participation and deposits. About 86 per cent of the external capital available were enjoyed by the members of the managing committee. Besides the mode of operation, the system of proper accounting, auditing and supervision were not satisfactory in one of the society under study. For efficient growth and development of the fishermen's co-operatives in Bangladesh, the traditional approach of organizing societies should be replaced by a scientific approach of forming societies, capable and efficient cadre of managers need to be trained adequately by the appropriate institution.

Agr.Econ. 9 Anwar, N. M. K. 1973. **A Study of Capital Formation Made by the Members of the Co-operatives under Comilla System.** *M. Sc. (Ag. Econ.) Thesis. Bangladesh Agr. Univ. 82 p.*

An analysis of time series data taken for five years from 1965 to 1970 was made to evaluate the rate of capital formation by the regular members of cooperatives under Comilla system. Thirty samples of regular members-15 each from two primary Agricultural societies—were randomly selected. The study showed that cooperative form of management brought about significant changes in the composition of total income and per capita income. Credit facilities appeared by the cooperative society made possible to use modern implements and to change the traditional Agricultural practices. Per capita loan absorption increased in every succeeding year and was higher in the case of big farmers and lower for small farmers. The yearly average per capita capital formation through thrift deposits and buying shares was calculated at Taka 43.90. The rate of capital formation was higher on the larger farms.

Agr.Econ. 10 Miah, A. K. 1973. **Case Studies on Management of Co-operatives in Relation to Peoples Interest in the Societies.** *M. Sc. (Ag. Econ.) Thesis. Bangladesh Agr. Univ. 45 p.*

Three cooperative societies in Mymensingh district were studied to verify the hypothesis that the membership of the board of directors are confined within a small influential group of people working for their own interest which significantly contributed to the failure of co-operative societies. The study revealed that failure of co-operative societies was caused mainly due to the unawareness of the general members who in most cases could not enjoy the benefits of co-operatives for the selfishness of the board of directors.

ECONOMICS OF PRODUCTION AND MANAGEMENT

Agr.Econ. 11Hussain, M, K. 1961.**Probleme Der LandwirtschaftOst-Pakistan (Agricultural Problems of East Pakistan).***Ph. D. Thesis. University of Bonn, WestGermany. Publisher MIS.Fotolanad, Frankfort, West Germany, 342 p.*

The study deals in general with the problems of agriculture in the then East Pakistan (now Bangladesh) so far as it is managed under traditional conditions. The study reveals that unfavourable land/ man ratio, inconvenient farm structure and its layout, land leasing and tenurial problems 'and traditional cultural practices and method of land utilization together with the problems of soil erosion and soil depletion inhibit the productivity and yield per acre. It is revealed from the study that quantitative and qualitative aspects of agricultural labour force such as, excessive pressure of population on land, disguised and seasonal unemployment and underemployment of farm labour and the increasing number of landless labourers with very low level of education, meagre amount of food consumption, ill nourishment and insanitary housing, seriously affect productivity of labour. The study throws light on the low rate of capital formation resulting from the low rate of saving and investment, as a result of the absence of adequate credit institutions and proper facilities. The study also discusses in length the organization and operation of farm business in relation to efficiency factors including farm budgeting and planning, resource allocation and cost and return analysis.

Agr.Econ. 12Chowdhury, M. R. A. 1967.**A Study of Land Utilization as Influenced by Different Factors in an Area of East Pakistan.***M. Sc. (Ag. Econ.)Thesis. East Pakistan Agr.Univ. 94 p.*

Fifty farms selected at random from a village of Mymensingh were studied. About 85 per cent of the total land owned was utilized for producing field crops and orchards. Aus, jute and aman paddy occupied more than 90 per cent of the total cropped area of which aman alone accounted for half of it. Less than 15 per cent of the total rice produced on the farms was marketable. About 70 per cent of the farmers were in debt to one or the other source of which friends and relatives provided 74 per cent of the total credit. About 34 per cent of the farmers were owner-operators, 12 per cent tenants, 10 per cent non cultivating owners and 40 per cent owner-cum-tenants. About 80 per cent of the total land was medium high. There were 7.2 persons per family of which 52 per cent were in the productive age group. The pattern of land utilization was found to be influenced combinedly by these human and non-human physiographic factors.

Agr.Econ. 13 Islam, M. A. 1967, **an Investigation into the Production Function Including Costs and Returns in the Production of Potatoes in ComillaKotwali Thana in 1966-67 Potato Season.** *M. Sc. (Ag. Econ.)Thesis. East PakistanAgr.Univ. 91 p.*

Fifty randomly selected farms from two villages provided data for this study. Yield per acre

averaged 85.5 maunds. Human labour and seeds were two major items of costs. Yields, costs and returns per acre declined as the acreage of potato grown per farm increased. Higher yield per acre was the combined result of better cultural practices, use of improved seeds; increased use of fertilizers, manures, pesticides and water. Standard production practices are yet to be fully followed by the farmers. The net money return so far received from potato production have tended to make it more popular than some of the other alternatives. Expansion of its cultivation has been delayed due to problems related to credit, supply of better seeds, technical advice, storage and marketing facilities.

Agr. Econ. 14 Islam, M. N. 1967. **Impact of Irrigation on Cropping Pattern and Production Practices in Two Villages under Comilla Kotwali Thana.** *M. Sc. (Ag. Econ.) Thesis. East Pakistan Agr. Univ. (MS).* 81 p.

The study undertaken in two villages under Comilla Kotwali Thana, was designed to determine the impact of irrigation on cropping pattern and production practices. Of the two villages one was selected to be irrigated while the other was non-irrigated and cooperative societies existed in both the villages. A comparative tabular analysis of the study revealed that irrigation had significant positive effect on the introduction of better seeds and fertilizer, availability of credit, training of farmers in improved practices etc. Which showed a combined greater effect on the yield of crops and cropping patterns intensity. It was concluded from the study that irrigation led to the diversification of crops and resulted in the greater intensity of cropping pattern.

Agr. Econ. 15 Karim, M. R. 1967. **Farm Accounting by Subsistence Farmers- a Study of 68 Selected Farmers in two Villages of Comilla Kowtali Thana Producing Boro Paddy in 1966-67.** *M. Sc. (Ag. Econ.) Thesis. East Pakistan Agr. Univ. (MS).* 98 p.

A detailed system of farm accounting requires record keeping of every aspect of the farm business. But this work aimed at studying only the system of keeping crop records as crops were the main enterprises with the farmers. Only nineteen per cent of the farmers studied, kept some kind of records. Of them some had more than three years' of experience in record keeping. Factors like ability to write one's own accounts, size of cultivable holding, cooperative membership, and engagement in non-farm business and use of modern inputs influenced account-keeping. Account keeping varied greatly to manners and content of entry. Accounts were not kept by all the other farmers mainly because of custom of non-keeping of written records but they appreciated the advantage of keeping it. The results of the study suggested that farmers could be motivated for keeping records not only for their own advantage but also for providing data for planning agricultural development.

Agr. Econ. 16 Kawnine, A. K. M. N. 1967. **An Economic Study of Farms Introducing Boro Rice Production at Kalyanpur, Mymensingh.** *M. Sc. (Ag. Econ.) Thesis. East Pakistan Agr. Univ. (MS).* 102 p.

Most of the farms studied were small by average standard. Irrigated boro acreage decreased with increase in farm size. Land was the single major form of capital investment followed by livestock and farm buildings. Yield of crops appeared to be low by national standards. Net farm income increased as the size of farm increased but not proportion to the size. Net farm income also varied directly with the amount of capital investment and the number of man-equivalents used per acre. Introduction of irrigated boro paddy brought changes in the cropping pattern and input structure of the farm business giving to adjustment problems to which the farms tried to respond rationally.

Agr.Econ.17 Masud, S. M. 1967.**Farm Costs and Returns in the Production of Boro Paddy under Low-Lift-Pump irrigation including analysis of causes of variation among farms in avillage area of East Pakistan.***M. Sc. (Ag. Econ.)Thesis.East Pakistan Agr. Univ. (MS). 156 p.*

Forty forms growing irrigated deshiboro paddy in two villages of Mymensingh district provided data for study. Yield per acre averaged 18.4 maunds with 37.5% coefficient of variation among farms. The acreage of boro paddy grown was positively related with the total farm size and was an important factor in economy of production. The variations in costs of production among individual farms were found to be relatively wide. The analyses of the causes of each variations pointed the way toward improvement for many of the farms. No single factor could be identified as responsible for success but a combination of factors properly integrated. This was characteristic of the science of economics and of the economic science of farm management. To the credit of the farmers, when they understood these things, they were quick to respond by adoption, revealing sharp understanding of their own circumstances.

Agr.Econ. 18Rahman, M. H. 1967.**Effect of Topography and other Factors on Farm Income.***M. Sc. (Ag, Econ.) Thesis. East Pakistan Agr. Univ. (MS).*

Seventy five farms from three villages representing low, medium and high elevation were studied. More than 60 per cent of the farms were below 4 acres in size. About 90-95 per cent of all the land was suitable for crops with different degree of susceptibility to seasonal natural hazards. In each type of elevation, both farm income and expenditures increased with the increase of farm size but the increase of expenses was relatively small as compared to income. Resulting net income per farm increased with farm size. But net income per acre had an increased relation with farm size particularly in medium and high elevations. Capital investment per farm, relative importance of crop as compared to crop by products and livestock products, total farm expenses and netfarm income per acre have increased gradually at higher elevations. Fragmentation was a common problem in all the elevations but the degree of fragmentation decreased with increase in farm size. The effect of industrialization, urbanization and development communication facilities were reflected by changes in the cropping patterns at medium and high elevation from all rice to quick market crop and vegetables thereby raising cropping intensitAgr.Econ. 19Hogue, A.

1968.**Costs and Returns- A Study of Irrigated Winter Crops.***A report published by Pakistan Academy for Rural Development, Comilla, East Pakistan. (MS). 105 p.*

The study was undertaken in 12 villages having cooperative societies affiliated to the Kotwali Thana Central Cooperative Association, Comilla. 160 plots, taken one plot from one farm, were randomly selected from 12 villages with the objectives of studying costs of production, cost pattern at different stages of operation, the return therefrom and so on. Five of the irrigated winter crops under study were IR-8, Taipei-177, country Boro, Shaitta and Watermelon. The study revealed that improved variety rice crops, IR-8 and Taipei-177, incurred higher costs than the country varieties, Boro and Shaitta. Much of this increased costs incurred in operating expenditures or more specifically, in labour and material inputs. IR-8 and Taipei-177 gave higher grain yields than Boro and Shaitta. Shaitta appeared to be better than Boro in respect of output return and output-input ratio. Watermelon incurred more cost and gave less output return than the improved variety rice crops.

Agr.Econ. 20 Meseruddin, M. 1968.**An Investigation into the Factors, Especially the size of farm, Effecting Farm Production and Income in a Similar Farming area under Mymensingh Kotwali Thana.***M. Sc. (Ag. Econ.) Thesis. East Pakistan Agr. Univ. (MS). 82 p.*

The study was conducted in Mymensingh Kotwali Thana to investigate into the factors, particularly the size of farm, affecting farm income and productivity. A tabular analysis revealed the increasing trend in the net farm income with the increase in size of farm. The average cost of all the items increased as the farm size increased except the cost of veterinary measure and decrease in inventory. The volume of farm business could be increased on small farms by adopting intensive cultivation and using better seeds, balanced fertilizer, irrigation water, insecticides and others.

Agr.Econ. 21 Ather, S. A. and others, 1969.**An Analysis of Costs and Returns in IRRI-8 and Local BORO.***Department of Econ, Univ. of Chittagong, East Pakistan. Rept. 43p.*

The present study has been undertaken to analyze the comparative cost and return of the selected winter crops namely (1) IRRI-8, (2) Local Boro and (3) Potato in Rangunia, Hathazari and Raozan Thana in the district of Chittagong. The required information regarding these three irrigated winter crops was collected on the basis of plots randomly selected for the purpose. The cost of production of IRRI-8 was considerably high while the purchased cost was almost double than the family cost. The cost of production of local Boro was not as high as in IRRI-8. The family cost was higher than the purchased cost in local Boro. The return in IRRI-8 was reasonably high in relation to the costs of production but the return in local Boro was lower than the cost of production. The cultivation of IRRI-8 was a profitable one, while the cultivation of local Boro was a losing concern.

Agr. Econ. 22 Elias, S. M. 1969. **A Study of the Economics of newly irrigated Boropaddy production in a selected area of Jamalpur Sub-Division.** *M. Sc. (Ag. Econ.) Thesis. East Pakistan Agr. Univ. (MS). 180 p.*

Fifty farms were randomly selected from Nandina and Sharifpur to study the economics of newly irrigated boro paddy production in relation to cost and return, farm to farm variation in cost and return, causes of such variation and the particular features of cropping pattern, cropping intensity and use of resources. The comparative tabular analysis showed that per acre production of IRRI variety was greater than that of local variety with a higher average net profit per acre. Net cost per acre of boro paddy production decreased with the increase in the size of boro area. Increased yield, return, and return per hour of labour in both the IRRI and local varieties were compatible with increased cultural practices and investment of different inputs. The introduction of boropaddy changed the cropping pattern in two villages. The study revealed that huge loss of water through seepage and non-availability of water in time caused high charge of water for the farmers.

Agr. Econ. 23 Jabbar, M. A. 1969. **An Economic Study of White Jute Production Improvement in a selected area of Mymensingh District.** *M. Sc. (Ag. Econ.) Thesis. East Pakistan Agr. Univ. (MS). 120 p.*

Farms producing jute under traditional and improved technologies were studied. It was found that with improved technology, there was opportunity for profitably increasing jute production but the technology as such was not a guarantee of success. Both yields and costs were factors in making a profit or loss in production. The relative contribution of a yield alone to produce a market effect on profit was noteworthy. The economy of scale was also evident in the use and cost of home supplied inputs which meant that the diseconomy of smaller acreage could not be overcome by the improved technology alone. 'Technological' cost was a minor factor in the total cost of production. So, factors responsible for variation in cost of producing jute and profit earned from it were independent of the technology of production used rather they were built into the farm business and the farming system.

Agr. Econ. 24 Quddus, M. A. 1969. **A Study of the Economics of newly Irrigated Boro Paddy Production in a selected area of Tangail Sub-Division.** *M. Sc. (Ag. Econ.) Thesis. East Pakistan Agr. Univ. (MS). 160 p.*

The study was undertaken in two power pump irrigation schemes-Tangri and Tunibari near Madhupur in the district of Tangail, to determine the costs and returns, variation in costs and returns among individual farm and causes for these variations in the production of boro paddy. Smaller farms used relatively more area under boro production. The average cost, yield and net return were higher in IR-8 variety than in local one. Farm to farm variations in costs, yield, return and return per hour of labour were very significant and weeding, dressing

and other intercultural operations were found responsible for these variations. Introduction of boro paddy had some effects on cropping pattern and cropping intensity of the scheme areas.

Agr. Econ.25 A Hsanullah, M. 1970.**An Economic Study of Costs and Returns in Irrigated Winter Rice Production in Relation to the Structure of Farmers Business.***Al. Sc. (Ag. Econ.)Thesis. East Pakistan Agr. Univ. (MS). 130 p.*

A group of farmers of the village Khagdahar in the district of Mymensingh was studied to analyze the production costs and returns and suitability, relationship and adjustment of boro paddy cultivation with the existing farmers' business structure. A detailed tabular analysis of comparative cost and returns of deshi-and improved varieties was made to measure their impact of introduction on farm structure. The average net cost per acre of producing IRRI-8 alone was lower than that of deshi variety grown alone while in case of farmers producing both varieties, costs of production of IRRI-8 was higher than that of deshi variety per acre. The average net profit was negative in case of deshi variety produced alone. The introduction of boro paddy had impact on the increased yield, additional land utilization more labour employment, use of new technology and inputs, replacement of minor crops by the major ones, reallocation of farm resources and increase off farm income and others.

Agr. Econ. 26 Kabir S. A. M. 1970. **Comparative Economic Study of the Production of IRRI-8 and Local Varieties of Rice in the Boro Season by Low-Lift Power Pump Irrigation in two Villages of Mymensingh District of East Pakistan.***M. Sc. (Ag. Econ.) Thesis. East Pakistan Agr. Univ. (MS). 176 p.*

The present study made a comparative cost and return analysis about the production of IRRI-8 and Local varieties of rice in the boro season in two villages, Kalyanpur and Salpoporian of Mymensingh district. Fifty, farmers, 5 producing IRRI-8 alone, 21 producing IRRI-8 with local varieties and 29 producing local varieties alone, were studied and the tabular analysis revealed that the average cost of production of IRRI-8 per acre was the highest on farms producing both the varieties and lowest for deshi on the same farms. The highest profit per acre was on farms producing only IRRI-8 and the lowest one was on farms producing only deshi. Variations among farms producing a given varieties often exceeded the average difference between varieties, which indicated the scope for making further improvement of the production of both the varieties.

Agr.Econ. 27Masud, S. M. and F. L. Underwood. 1970. **"GumaiBil" Boro Paddy Profits and Losses.***F. M. Research Report No. 5, Bureau of Agricultural Economic, Statistical and Socioiological Research.BA U. 52 p.*

Data from farms producing a combination of deshi, IRRI-8 and IRRI-9 provided data for the study. Comparison among these three categories pointed to sharp contrasts; comparison within them revealed important relationships of cause and effect. Both returns and costs were factors in making a profit or loss in production. Efficiency in the use of fixed

resources of the farm influenced the profit substantially because such costs dominated even on the technologically improved IRRI farms. Yield of paddy per acre was a main factor in providing returns. However, many IRRI growers incurred losses while many deshi growers with half the yield rate of IRRI made some profit mainly because of difference in costs. Technical improvements in rice production were insufficient to cure all its economic ills and also the economic ills of the total farm business.

Agr.Econ. 28 Sheikh, M. H. R. 1970. **An Economic Study of Farms Producing Tomato in the village area of Mymensingh Kotwali Thana in East Pakistan.** *M. Sc. (Ag. Econ.) Thesis. East Pakistan Agr. Univ. (MS). 76 p.*

Twenty tomato growers were randomly selected for studying the important aspect of production and marketing of tomato in Mymensingh Kotwali Thana area. The study was mainly designed to estimate the relative contribution of various inputs in the total cost of production and marketing of tomato and ascertain possible reasons for comparative profitability of this crop. Net profit per acre in the production of tomato was found to be substantially higher. Marketing functions of tomato were mainly performed by producers-cum-sellers, beparies, retailers and aratders. Production of tomato created new employment opportunities for unemployed labour and land during winter season.

Agr.Econ. 29 Alam, S. 1972. **Comparative Economic Study of the Production of some selected varieties of IRRI and local Transplant Aman Paddy in Bangladesh Agricultural University.** *M. Sc. (Ag. Econ.) Thesis. Bangladesh Agr. Univ. (MS). 63 p.*

The present study was undertaken as a part of the 'US/AID' integrated research project on rice' in 1970 with a view to estimating the relative profitability of IR-20, IR-95, IR-661 varieties of paddy in relation to the local variety, Naizershail is grown in Bangladesh Agricultural University farm under controlled conditions. IR-20 and Naizershail appeared to be more promising than the other two imported varieties in respect of cost and return and profitability.

Agr.Econ. 30 Ali, M. Y. 1972. **An Economic Study of Costs and Returns of Producing Transplant Aman Paddy under Non-Irrigated Condition in some areas of Muktagacha Thana under the District of Mymensingh.** *M. Sc. (Ag. Econ.) Thesis. Bangladesh Agr. Univ. (MS). 120 p.*

The present study, undertaken in six villages of Muktagachathana in the district of Mymensingh, was designed mainly to determine the real worth from the production of transplant aman paddy under natural conditions. It dealt with the estimation of costs and returns, variations in costs and returns, factors causing such variations. Forty eight sample farms were classified into four categories, such as, farms producing early and intermediate varieties, farms producing only intermediate varieties, farms producing early, intermediate and late varieties and farms producing intermediate and late varieties. The average highest cost add lowest net return per maund were in case of farms growing only intermediate

varieties while the average lowest cost and highest net return per maund were obtained in case of farms producing early intermediate and late varieties. The present study concluded that the production of transplant aman paddy under natural condition with old methods of cultivation was a profitable business.

Agr.Econ. 31 Dhali, M. K. A. 1972. **An Economic Evaluation of Thakurgaon Deep Tubewell Project.** M. Sc. (Ag. Econ.) Thesis Bangladesh Agr. Univ. (MS). 84 p.

10 tubewells out of 362 within the Thakurgaon deep tubewell project in the district of Dinajpur were studied to evaluate the economic and financial implication of the project and the causes of varying performances of tube well within the area. The introduction of irrigation brought about distinct change in the cropping pattern which made it possible to cultivate a good number of crops which were never practiced in the area. Broadcast aman was mostly replaced by transplant aman in the project area and irrigation contributed significantly to increase total production of important crops. The variations in the performances of tube wells were mainly caused due to loss of irrigation water for Kutcher Canal and tributaries, leakage and breaking of the Kutcha (Mud Canals) Canals, type of soil distance of irrigated plot from the tube wells, levelling of land and the negligence of the operators. The yields per acre of both broadcast and transplant aman were increased by 22.72 per cent and 32 per cent in 1969-70 respectively. Cost was calculated from two aspects, from cost and project cost, and the cost and return analysis revealed that net return was on an increasing trend and it increased by 45.16 per cent in 1969-70 taking 1967-68 as the base year.

Agr.Econ. 32 Jabbar, M. A. and M. F. Hague. 1972, **Cost Return Analysis of Aus Paddy Production in Muktagacha, Mymensingh.** F. M. Research Report No. 6. Bureau of Agricultural Economic, Statistical and Sociological Research, B. A. U.

Yield rate and return over cash expenses was higher on smaller farms but return over cash and non-cash expenses was higher on the larger farms due to better opportunity of using fixed resources on those farms.

Agr.Econ. 33 Mian, M. S. 1972. **A Comparative Study of the Economics of Cultivation by Bullock and Power tiller in the Production of Transplant Aman Paddy in some Selected Areas of Bangladesh.** M. Sc. (Ag. Econ.) Thesis. Bangladesh Agr. Univ. (MS). 102 p.

Forty three sample farms were studied from Tangail and Mymensingh districts covering 302 acres of land. The average per acre cost of Transplant aman cultivation by using power tiller was Taka 508.82 as against Taka 568.08 by bullock cultivation. The Cost of combined bullock and power-tiller use was Taka 512.31 per acre. Net return was comparatively higher under combined cultivation i.e., Taka 353.91 per acre as against Taka 252.22 and Taka 341.56 per acre under bullock and power-tiller cultivation respectively. The average yield of rice was 31.17 mounds, 32.37 maunds and 32.65 maunds per acre under bullock, power-tiller and combined cultivation respectively. The use of power-tiller over bullock power was felt

advantageous under efficient management, easy availability of spare-parts and fuel.

Agr.Econ. 34 Molla, A. R. 1972. **An Economic Analysis of farms using Low Lift Pump Irrigation Water in Jessore District.** *M. Sc. (Ag. Econ.) Thesis. Bangladesh Agr. Univ. 110 p.*

The study was conducted in the year 1970 with major objectives of assessing the economic value of improved production practices. It was found in the study that the availability of irrigation water enabled farmers to produce additional crop like boro, IR-8, IR-20, etc. Besides the principal crops, many new varieties of winter crops viz., pulses, potato, brinjal, etc. were also provided with irrigation water. It was revealed from this study that fertilizers and irrigation water were the factors responsible for increased production. It helps bringing additional land under cultivation during dry season, which otherwise would have been kept fallow. Irrigation facilities provide opportunity for work to the disguised idle labour in the farm.

Agr.Econ. 35 Rahman, M. H, 1972. **Cost of Production of Major Varieties of Tobacco in Some Selected Areas of Rangpur.** *M. Sc. (Ag. Econ.) Thesis. Bangladesh Agr. Univ. (MS). 98 p.*

The object of this study was to examine the costs and returns of three important varieties of tobacco grown abundantly in Rangpur in the year 1969-70. The three varieties chosen for analysis were Virginia, Jati and Motihari. The total net cost per acre of producing tobacco averaged Taka 633.37 for Virginia, Taka 765.68 for Jati and Taka 683.54 on the Motihar farm. The net cost per maund, of tobacco averaged Taka 14.26 for Virginia (green) Taka 69.10 for Jati and Taka 68.56 on the Motihar farms. At the assumed price of Taka 16.00 per maund of tobacco for Virginia, Taka 75.00 per maund for Jati and Taka 77.00 per maund of Motihar, profit per acre averaged Taka 77.03, 65.32 and 84.15 for Virginia, Jati and Motihar farms respectively. In general, increased profit per acre of the farms in this study was associated with increased tobacco yields per acre. Increasing yield per acre was associated with increasing net cost per acre but the increase in net cost was more than offset by the increased yield and that is how the farms obtained profit. One important conclusion which might be drawn is that given the unit cost of producing tobacco around the average cost arrived at in this study the net return per acre will depend on the per unit price of the produce.

Agr.Econ. 36 Talukder, R. K., 1972. **Economic Study of Costs and Returns of Producing Transplant aman Paddy in some Deepubewell areas of Thakurgaon Sub-Division of Dinajpur District.** *M. Sc. (Ag. Econ.) Thesis. Bangladesh Agr. Univ. (MS). 100 p.*

Forty eight farms producing transplant aman paddy constituted the sample size for the study. Of the 48 farms, 34 producing deshi variety alone were the non-irrigated farms

and 14 producing deshi with improved varieties were irrigated farms. Farms producing deshi with improved varieties were relatively larger than those producing deshi variety alone. The average per acre gross as well as net costs of producing transplant aman paddy were lower on farms producing deshi variety alone than on farms producing deshi with improved varieties due to lesser inputs used by the former group of farms. Human labour was the largest item of cost followed by the cost of land use for both the group of farms. The average yield of paddy as well as the average net return per acre were higher on farms producing deshi with improved varieties than on farms producing deshi variety alone. Farms with smaller acreages of transplant aman had higher average cost per acre. The average net return per acre, however, consistently increased with decrease of aman acres on both the group of farms. The relatively better performance by the farms producing deshi with improved varieties could be attributed to, among other things, the use of irrigation water and improved varieties of seeds. The varieties like DA-31 and Pak-Hook could conveniently be introduced in the area.

Agr. Econ. 37 Haque, G. H. M. A. 1973. **Comparative costs and Returns in aus Paddy Production in Phulbaria, Mymensingh.** *M. Sc. (Ag. Econ.) Thesis. Bangladesh Agr. Univ. (MS). 123 p.*

50 farms, 23 producing traditional and 27 improved varieties of aus paddy, were studied in relation to comparative costs and returns, farm to farm variation in costs and returns and the relative advantages of the different varieties of aus paddy under farm conditions. Net cost per acre was the highest for improved group of farms while the lowest one was found for Deshi group of farms, Yield per acre was found to be the combined effect of such factors as sowing and harvesting dates, number of weeding, manures and fertilizers used.

Agr. Econ. 38 Hoque, S. E. 1973. **An Economic Investigation into the Production of Aman Paddy Under Traditional and Improved Conditions on Some Farms in the Ganges-Kobadak Irrigation Project area, Kushtia, Bangladesh. (An Aggregate Production Function Analysis).** *M. Sc. (Ag. Econ.) Thesis. Bangladesh Agr. Univ. (MS). 110 p.*

The study deals with two sets of farmers—one with some kind of economic incentives like high yielding seeds, fertilizer and row planting and the group with the usual deshi variety seeds and other inputs. A tabular analysis of the study revealed some facts about comparative cost and structure, variations in cost and return. Efficiency of resource use was measured by Cobb-Douglas production functions estimated for the two contrasting sets of farms and it was indicated that there was scope for making outward adjustment to both fertilizer and labour in the production of both improved and deshi varieties of aman paddy.

Agr. Econ. 39 Hossain, M. J. 1973. **Utilization of Hired Labour for farm operations during winter in Comilla Kotwali Thana.** *M. Sc. (Ag. Econ.) Thesis. Bangladesh Agr. Univ. (MS). 81 p.*

Fifty farmers randomly selected from *ten* village under Comilla Kotwalithana were studied in relation to the utilization of hired labour for various farm operations; the characteristics of farmers employing hired labour in terms of land holdings, ' economic conditions, number of adult male population and adult male members having other occupations, sources of hired labour, relative dependence of farmers on family and hired labour and the wage rates for hired labour. On the average a farmer used 47.90 man days of hired labour per acre for all the operations. The maximum amount of hired labour was used for weeding. On the average a farmer used 22.71 man-days of family labour per acre for all the operations. Forty per cent farmers used hired labour supplied mainly from his own village and twenty per cent farmers used hired labour from the neighbouring village. Maximum utilization of hired labor was found during the peak period of the crop season.

Agr.Econ.40.Hossain, M. M. 1973. **A Comparative Economic study of irrigated and non-irrigated Farms in an area of Deep Tube well Irrigation in Jessore District.** *M. Sc. (Ag. Econ.) Thesis. Bangladesh Agr. Univ. (MS) 133 p.*

Forty irrigated and twenty non-irrigated farms were selected at random from three deep tube well irrigated scheme areas in Kotwali and Sharsa Thana of Jessore district to study the relative cost and return of both irrigated and non-irrigated farms and selection of irrigation on cropping pattern, yield and resource use. Tabular analysis revealed that irrigation was the most strategic factor for raising agricultural production. Irrigation showed greater scope of intensive cultivation during dry season which created profitable employment opportunities for labour resources under higher technological conditions.

Agr. Econ. 41 Hossain, M. and M.A. Quddus. 1973. **Some Economic Aspects of Jute Production in Bangladesh in inter District Study.** *The Bangladesh Econ. Rev. 1(3), 269-296.*

The movement of acreage, yield and production of jute in 15 jute growing districts of Bangladesh from 1947-48 through 1969-70 were studied and returns per acre of marginal land in jute, and its substitute, as aus rice, were also estimated. Attempt was made to estimate a ratio of jute price to aus rice price that would make these two crops equally profitable to the growers, with technology and other things remaining constant. In the past production of jute was sought to be increased through devoting more area under jute cultivation without paying any attention to increasing the yield of jute. Since some cost reducing technological change has taken place in the cultivation of rice, poor land have been put under jute cultivation with relatively less care creating adverse effect on jute yield. Future policy should pay more attention to increase jute yield thorough technological improvement. If acreage expansion policy is to be pursued, it should be done in minor rather than major jute growing districts. The grower's price of jute should be 1.5 times higher than rice at the national level. A district wise study of the critical jute: rice price ratio appeared to indicate that a 3:2 ratio of jute price to rice price would induce farmers to produce more jute in *all* districts except in Rangpur.

Agr. Econ. 42 Hossain, M. S. 1973.**An Economic analysis of resource use in Transplant aman Production under Share Leasing Arrangement in a selected area of Mymensingh District.***M. Sc. (Ag. Econ.)Thesis Bangladesh Agr. Univ. (MS.) 70 p.*

Two types of farmers-owner-operator and share-croppers in two villages, namely Boyra and Sutiakhali, were studied to find out the efficiency of resource use and to estimate cost and return, in the production of transplant aman paddy under the two tenure systems. Average farm size also estimated for the two categories of farmers. The leasing system commonly practiced in the area was fifty-fifty crop-sharing in between the landlord and the sharecropper; where the farmer provided the land and half of the seed cost and the latter supplied all other fixed and variable costs. The leasing parties were found to share the total produce and byproducts equally. In Boyra, the average farm size was 2.24 acres for owner-operator while that of the share-cropper was 1.74 acres. The average per acre cost of cultivation as incurred by the share-cropper was the highest in Sutiakhali and the lowest in Boyra. Owner-operator of both the villages incurred almost equal cost of production. In Boyra, the owner-operator gained a net return of about four times larger than that of share-cropper. But in Sutiakhali, share-cropper incurred a net loss while the owner-operator earned a net profit. Lack of institutional credit facilities was identified to be the major factor which handicapped the raising farm productivity. Suggestion have been made for making provision for new inputs, new method of production, and proper credit facilities,

Agr. Econ. 43 Islam. M. F. 1973.**Economic Impact of Tube well Irrigation in Thakurgaon.** *M. Sc. (Ag. Econ.)Thesis. Bangladesh? Agri. Univ. (MS.) 81 p.*

The study dealt with selected farms under six deep tube-well irrigation schemes in Thakurgaon. Survey method was used for collecting data. A linear production function and simplex method of linear programming were used for data analysis. Results revealed that per acre yield of almost all the crops was higher on the irrigated as compared to the non-irrigated farms. Average farm business income was twice as much on the irrigated farms as compared to non-irrigated farms. Farm business profit was negative on the non-irrigated farms. Neither of the techniques could give actual nature of returns to scale. Except family labour, all the other inputs used in the function were found to have been efficiently used. For earning maximum profit, linear programming solution suggested to produce Aman, IR-20 and Sugarcane on the irrigated farms and Aus, Pulses and Sugarcane on the non-irrigated farms.

Agr. Econ. 44 Rahman, M. 1973.**An Economic Study of Jute Production in a selected area of Mymensingh District,***M. Sc. (Ag. Econ.)Thesis Bangladesh Agr. Univ. (MS).*

Forty two farms-21 following improved practices and 21 following the traditional practices were selected at random from the village Shaltia under Mymensingh district to study the

economics of jute production particularly in relation to cost and return, farm to farm variations in cost and return and the farmers plan for jute production. In improved system, fibre yield per acre was 15.50 maunds for Capsular and 17.40 maunds for Olitorius while under traditional system yields were 4.90 maunds and 16.70 maunds for the two varieties respectively. Yield of jute was found to be the cumulative effect of factors, such as, sowing period, line sowing, crop rotation, harvest time, application of fertilizer and many other inter-cultural operations including retting. Yield was again found to be inter-dependent on size of farm, cropping intensity, nature of soils and the managerial aptitude of the operator. Cost of production of jute per acre was found almost the same for Capsular and Olitorius under both the improved and traditional systems with a lower figure for Capsular under traditional systems.

Agr. Econ. 45 Rahman, M. M. 1973. **Some Aspects of the Economics of IR-8 Rice Variety with Special Reference to Certain areas of Bangladesh.** *M. Sc. Thesis. University of London. (MS). 60 p.*

The study was designed to look into the cost compositions and returns of two varieties of rice, e.g., IR-8 and Traditional variety as grown in some areas of Bangladesh. Relative profitability, optimum conditions for the success of the IR-8 technology, opportunity cost of IR-8 technology and the resource use pattern and the efficiency of resource allocation were also studied with workable techniques. Information needed for the purpose were collected from secondary sources. Keeping in view all the difficulties, IR-8 was found to perform better than the TV. The social opportunity cost of growing IR-8 was found to be quite high and its acceptance by the farmers was subject to the minimization of risks and constraints that were found to be associated with the technology.

Agr. Econ. 46 Rochin, R. I. 1973. **A Study of Bangladesh Farmer's experience with IR-20 Rice Variety and Complementary Production Inputs.** *The Bangladesh Econ. Rev. 1 (1), 71-94*

Surveyed the various technological and organizational aspects of IR-20 rice production programme, evaluated their performance and suggested means for improvement.

Agr. Econ. 47 Smith, D, V. 1973. **Opportunity for village Development: The ponds of Bangladesh.** *The Bangladesh Econ. Dev. 1 (3), 297-308.*

The Bangladesh tanks/ponds is a valuable asset in spite of a certain lack of glamour. Fish are valuable supplements to the average 'Bangladeshi' diet. Fish and fish products are potentially important export items. Tanks can play an important role in water management by considerably increasing the area under supplemental irrigation. The development of tank/ponds resources do not require importation of sophisticated capital-intensive technology and can rely on skills and resources built up within Bangladesh. It is a good complement to rural works, low-lift pump and small tube-well schemes already on going,

and it can be integrated into the planning and operation of large water control projects to ensure rational water management in the interior of developed areas. Tank development is a labour intensive and highly productive activity whose within-year schedule can be adjusted to peaks in labour availability. The existing institutions related to fisheries have been reviewed and an institutional structure has been suggested for development of tank/ponds.

Agr.Econ. 48 Zaman, M. R. 1973.**Sharecropping and Economic Efficiency in Bangladesh.** *The Bangladesh Econ. Dev. 1 (2): 149-172.*

The paper focused on the empirical aspects of the operation of share-cropping in two areas where controlled irrigation and use of other modern inputs have been introduced in some farms, along-side the existence of the traditional system of cultivation in many others. An attempt was made to rationalize the system of sharecropping both from the point of the owner as well as the tenant. It was also shown under what conditions share-cropping may become a socially desirable institution for the achievement of maximum aggregate economic gains. It appeared that sharecropping arrangements as such do not prevent the acceptance of modern inputs in Bangladesh. It was also found that land owners and share-croppers share often the costs of such modern inputs in the same proportion as output is shared between them. But one special problem in applying modern inputs is that the share-croppers do not have easy access to institutional credit. Even when costs are shared, they are initially borne by the tenants and inadequate credit then become a hindrance to using modern inputs. Since sharecropping involves 25 to 50 per cent of farmers in Bangladesh, this problem should get urgent treatment.

Agr.Econ. 49 Wahab, M, A. 1973.**Influence of farm size on some Farm Business Factors in Bangladesh.** *M. Sc. (Ag. Econ.)Thesis. Bangladesh Agr. Univ. (MS). 91 p.*

The study was carried out with an attempt to seek relationship between the farm size and the efficiency factors and to find out the most efficient farm size. Data were collected from the secondary sources-11 farm management studies conducted in Bangladesh Agricultural University, Mymensingh. Highest per acre yield and net income were found in the smallest size group.

Marketing and Price Analysis

Agr.Econ. 50 Dewan ,B. K. 1967.**A Study of Fish Marketing in the Mymensingh Town.***M. Sc. (Ag. Econ.)Thesis. East Pakistan Agr. Univ. (MS). 91 p.*

The study was conducted in two fish markets, Machua bazar and Natun bazar in Mymensingh town to find out the types of fishes available, their sources and supplies, and the market structure. 15 licensed commission agents and 117 retailers, both permanent and temporary, were interviewed for a period of four weeks. 38 different types of fishes were available and the main sources of supply was the local areas while the other sources were Mohanganj, Chandpur, Bahadurpur, Kuliarchar, Tistamukhghat, Dewanganj bazar, Dacca and Narayanganj. Marketing channels consisted of 'nikaris' or carriers, auctioneers, 'chalanis' or despatchers, 'aratders' or 'Commission agents, and retailers. About 93 per cent of total supply of fish was received by railway transport and the country boats were the important means of transportation at the primary stage. There were no storage facilities, system of weights and measures and grading.

Agr.Econ. 51Quasem. M. A. 1967.**A Study of Rice Marketing in Mymensingh Municipal area.***M. Sc. (Ag. Econ.) Thesis, East Pakistan Agr. Univ. (MS). 83 p.*

Data for this study were collected by interviewing the retailers, "beparis" and roadside dealers at random. The study dealt with the marketing of cleaned rice and as such did not include processing and operations in the analysis, 'Beparis' were most important suppliers of rice while the services of retailers and rationed rice dealers were of paramount importance in case of distribution. Storage operation was limited due to licensing system and anti-hoarding laws. Efficient grading and standard weights were non-existent. Factors like purchase price, transport and storage costs and nature of seller competition played more important role in price formation chain the simile forces of demand and supply. Considered from the view point of seller concentration, product differentiation and condition of entry, the rice market in the Mymensingh Municipal area could not be considered as perfectly competitive.

Agr.Econ. 52Ahmed, J. U. 1969.**Production and Marketing practices affecting grower prices of White Jute in some areas of Mymensingh.***M. Sc. (Ag. Econ.)Thesis.East Pakistan Agr. Univ. (MS). 163 p.*

The study covering Mymensingh Sa-der South Sub-division provided data to support the hypothesis that grower prices of jute might be influenced by farmer's own production and marketing practices as well as the structure, conduct and performance of trade and industry at higher levels.

Agr.Econ. 53 Shamsuddin, A. J. M., 1969. **An Economic Study of selected primary Livestock markets in the District of Mymensingh.** *M. Sc. (Ag. Econ.) Thesis. East Pakistan Agr. Univ. (MS). 94 p.*

Data collected by interviewing owner or leasee, effective buyers and sellers, and intermediaries from fifteen purposively selected markets were analyzed. Seasonal variation in supply of livestock arose basically from the effect of demand, climatic factors and the urgency of the need for disposing animals by farmers. Highest assemble of animals was found in the month of October to January. Other than dealers, all the buyers and sellers e.g. farmers, retail meat dealers etc. were mostly purpose specific. Price was determined by negotiation and bargaining between individual sellers and buyers based on certain factors e.g. breed, sex, outlook and the use or purpose of buying the animal. Seasonal and spatial variations in the price were significant in some cases. Other than the usual force of demand and supply, lack of communication facilities was the most important contribution to spatial price variation.

Agr.Econ. 54 Farruk, M. O. 1970. **The structure and performance of the rice marketing system in East Pakistan, Occasional Paper No. 31.** *Department of Agricultural Economics, Cornell University. USAID Prices Res. Project, 147 p.*

Focal areas chosen for the study were whole sale rice markets, Zinzira and Badamtali, the main supply/hinterland of rice to the retail shops in Dacca. Madanganj and Narsingdhi, the sources of supply for the industrial, urban and semi-urban population at Narayanganj were also in coverage. Rice marketing is carried on by a large number of intermediaries. Aratdars appeared to be the largest market functionaries furnishing wide varieties of services. The processing sector is composed of nearly 100 large rice mills heavily concentrated in the northern districts. Internal shipping pattern demonstrates the rational development of the present system. The study does not show economic rationale for Government regulatory actions. Quite high correlation of prices between markets suggests that prices in spatially separated markets move in unison. Inter-market price differentials as well as inter-temporal price increase indicated that such variations during the period of review were higher than the cost of transfer and storage respectively. Wide margins and costs were not appeared to result from oligopolistic elements in the trade.

Agr.Econ. 55 Jabbar, M. A. 1972. **A Note on the price response studies in relation to Jute.** *Indian J. (Ag.Econ.) (1).*

Regression models used for estimating price response are based on the assumption of hundred per cent shiftability between jute and paddy (both aus and aman) in the event of a relative change in the price of these two crops. Empirical investigations in major jute growing areas of Mymensingh suggest that only aus is the effective competing crop of jute and that in the event of a price twist, aus and jute are shiftable only up to 70 per cent of the total cultivable area.

Agr.Econ. 56Molla, M. R. I. 1972.**Aus Rice Drying in Bangladesh, (A Case Study)**,*Misc. Report No 3, Dept. of Co-operation and Marketing, Bangladesh Agr. Univ. (MS).*

Rice plays a vital role in the economy of Bangladesh. But she is extremely deficit in the production of this important food crop. The country imports about 726,000 tons of grains annually. Aus rice constitutes about 24 % of the total rice production in the country. The on-going practice of drying paddy in the country is the age old method of sun-drying. Aus is harvested during the rainy season, and faced with severe drying problems due to frequent bad weather and insufficient sunlight. During aus harvesting season from June to August, at Mymensingh, there were only 11 sunny days and 30 partly sunny days. The remaining 51 days were either rainy or cloudy with very little or no hours available for drying paddy. It was also observed that often the rainy or cloudy days continued for about 7 to 8 days. During June to August only an estimated 346 hours were available for effective drying purposes. Lack of adequate drying facilities, thus, caused losses of about 22.7% of the value of aus rice production at the commercial farm at Feni. A suitable mechanical on-farm drying equipment suitable for small scale operation in rural areas may reduce this type of critical losses particularly of aus paddy to a large extent. However, further investigation and economic analysis of the comparative economics of sun-drying and mechanical drying for this crop is essential for drawing any definite conclusion.

Agr.Econ. 57Molla, M. R. I. 1972.**Sweet Potato Chips- A Consumer Acceptance Test in Bangladesh.***Misc. Report. No 1, Dept. of Co-operation and Marketing, Bangladesh Agr. University (MS).*

Potato chips are fairly popular snack food among the urban high income consumers in Bangladesh. Sweet potato chips are completely new products to our consumers. Sweet potato as such is considered as an inferior and 'poor men's' food by our high income families and, thus, lacks consumer preference. But it is a nutritious food, the yield potential is high and the cost of production per mound low; thus, the sweet potato chips appear to have a high potential as snack item among urban consumers in the country. The pilot consumer acceptance test results, however, indicate that chips made from sweet potato need further qualitative improvements with regard to thinness and crispiness for being fairly acceptable to our urban consumers. On the other hand, further qualitative improvements of chips with available quality and variety of sweet potato in the country is not found to be encouraging. It is, therefore, suggested that a chipping variety of sweet potato which will have less fibre content and will be slim in shape be developed in the country. Further studies of this nature are, however, thought essential before making a definite conclusion on the consumer acceptability of sweet potato chips in our country.

Agr.Econ.58 Molla, M. R. I. 1972.**Inventory recording in Consumer Co-Operatives in Bangladesh (A Case Study of selected Stores).***Misc. Report No. 2, Dept. of Co-operation and Marketing, Bangladesh Agr. Univ. (MS).*

Inventories are a source of the most difficult accounting and management problem in retail stores handling a great variety of merchandise. Consumer co-operative store is a marketing institution engaged in retailing. Retailing a multitudinous detail requiring a large expenditure on clerical establishment for processing transaction, accounting for sales and purchases, recording inventory information, and, thus, exercising control over the store management. In some consumer store in Bangladesh the annual stock turnover is as high as 14, number of daily sales transactions is as large as 138, sales per transaction is as low as Taka 3.30, number of items sold daily is as large as 300 with 5 items sold per transaction. But the consumer stores are heavily dependent on the honourary services in the conduct of affairs and spend as labour cost only 3.43% of the consumer Taka they receive. Sufficient stock shortages due to shoplifting, theft, malpractices, by salesmen, etc. are observed in the consumer cooperatives. Both periodical and perpetual systems of recording inventory are followed in the consumer stores. A system of 'reconciled retail' inventory which, with lower cost would largely replace the perpetual system of recording inventory may be fruitfully used in the consumer cooperative stores in Bangladesh.

Agr.Econ. 59Molla, M. R. I. 1972.**Income Effects of the Prevailing Pattern of Coconut Harvesting in Bangladesh.***Res. Rep. No.1, Dept. of Co-operation and Marketing, Bangladesh Agr. Univ. (MS).*

Both mature and green tender coconuts are commercially produced and marketed in Bangladesh. Traditionally the coconut growers harvest both green nuts ('dab') and mature ('narikel'/coconut) from the same tree; green mature nuts are produced at the rate of 36 and 64 per cents respectively. Production of green nuts are criticized as national wastage by the nutritionists and industrial scientists. Growers intuitively estimate that production per coconut tree would be 43 mature nuts or 58 green nuts. Based on this yield ratio and farm price ratio of green and mature nut it is found that coconut growers in the coastal region lost at least 1 paisa per green coconut produced for sale in 1969. However, the fact that mature nuts constitute 64 per cent of the total production and 67 per cent of the total marketed surpluses of the growers indicate that the production decisions are consistently influenced by economic considerations towards maximization of benefits. Results of the study also show that as long as the income from production of coconuts constitutes relatively a significant part of producers' total annual income they strive to maximize their revenue from this source by producing proportionately more mature nuts.

Agr.Econ. 60Akhter, G. M. 1973.**Marketing of Potato in some selected areas of Comilla Kotwali Thana,***M. Sc. (Ag. Econ.) Thesis. Bangladesh Agri. Univ. (MS).*

A group of 25 farmers from five different villages and 20 intermediaries from five

important markets of Comilla Kotwali Thana were studied to investigate the sources of supply and disposal of potato, types of intermediaries involved in the marketing of potato, the mode of transportation, storage, system of weights and measures, price-spread and seasonal price fluctuation of potato. Distribution of potato from the farm level to the consumer's hands was performed by producers, retailers, aratdars and wholesalers. Transports mainly used in the marketing of potato were cycle rickshaw, bullock carts, truck and tractors and human labour and the transportation cost was found to be lowest for truck and highest for cycle rickshaw. Weight system from market to market, storage operation and grading of potato were found very unsatisfactory. Producers could not get actual price for product and different intermediaries were found to make good margin over the purchase price. The weekly, monthly and yearly fluctuation of potato price was very significant to the extent that off season price of potato was substantially higher than the harvest price.

Agr.Econ. 61 Alamgir M. and L, J. J. B, Berlage. 1973. **Food Grain (Rice and Wheat) Demand, Import and Policy for Bangladesh**, *The Bangladesh Econ.-Rev. 1 (1)*, 25-58.

Time series data have been used to analyses the food grain demand in Bangladesh over the period 1950-51 to 1968-69 and to make projections for the future which were then used to calculate import requirements and the market price of local rice that would occur if the production projection were not realized. Domestic rice production was treated both as a deterministic variable as well as a stochastic variable. The entire analysis was carried out under alternative assumptions about substitutability between imported rice and wheat with local rice. Three conclusions suggested by the results of the analysis are: (i) the quality of time series data needs to be improved in order to obtain realistic elasticity estimates; (ii) under all assumptions, the required import of food grain into Bangladesh will increase if the market price of local rice is to be maintained at a reasonable level; (iii) the local market price of rice is significantly influenced by total availability of food-grain.

Agr. Econ. 62 Ali, M, H. 1973. **An Economic Analysis of Marketing operation of The Eastern Milk Producers Co-operative Union Ltd. At Lahirimohanpur under the District of Pabna, Bangladesh**. *M. Sc. (Ag. Econ.) Thesis. Bangladesh Agr. Univ. (MS)*.

The study on the economic analysis of marketing of dairy products of the Eastern Milk Producers, Cooperative Union Ltd, at Lahirimohanpur, Pabna was undertaken with the specific objectives to find out the sources of supply of milk, channel of marketing of finished milk products produced by the plant, sales methods and policies, cost of marketing involving processing, transportation, storage etc. Data collected from the books and records of the plant revealed that the seasonal variation in milk supply arose basically from the scarcity of fodder and the rigidity in the procurement decision of the plant. Milk supply to the plant was mainly ensured by large number of small producers, producer's cooperatives, farms and middlemen who used human labour as the only means of transport. Major anomalies in disposition of milk and milk products arose

because of the absence of any marketing section of the plant and this situation often led to the heavy damage to the finished milk products.

Agr.Econ. 63 Asaduzzaman, M. 1973. **The Seasonal Variation in Price of Rice, Bangladesh 1950-1972.** *The Bangladesh Econ. Rev.* 1 (2), 213-220.

Two sets of price-data, one for medium quality rice and the other for coarse quality rice were analyzed to find seasonal indices and their properties. The method of moving average has been used to analyse the price data. Results produced stable seasonal factors defined as averages of adjusted seasonal irregular ratios. A comparison with planning commission estimates produced different results mainly because of the differences in the extent of coverage of markets. Seasonal fluctuation alone was found responsible for the ups and downs in the price in a given year and it was more pronounced in case of medium rice. The extent of public share and the pattern of government off takes imply a strong dampening effect in the fluctuations in the prices of rice suggest that the government should strive for a better distribution system.

Agr.Econ.64 Baten, M. A. 1973. **Factors affecting the quality and price of Jute in some selected area of Bangladesh.** *M. Sc. (Ag. Econ.) Thesis. Bangladesh Agr. Univ. (MS).* 167 p.

The present study was undertaken in Kanaipur Union of Faridpur district and Jhikergacha Union of Jessore district with the objective of determining the factors affecting the quality of jute, marketing of Jute and its prices received at the grower's level. Tabular analysis of one hundred farmers sampled for the purpose revealed that the production of quality fibre was directly influenced by the factors such as topography of soil, sources of seeds, application of manures and fertilizers, uses of insecticides, stages of harvesting and sources of getting water. Factors like variety of Jute, place and nature of sale, type of intermediaries, time, location and costs of marketing *etc.* were considered to have very close relationship with the price of jute received at farm level. Month-wise sale records showed that early harvest price of jute was lower than the price at later months.

Agr.Econ. 65 Hossain, M. M. 1973. **Transportation system affecting marketing efficiency of Rice in some selected areas of Comilla.** *M. Sc. (Ag. Econ.) Thesis. Bangladesh Agr. Univ. (MS).* 122 p.

The study was undertaken in Kotwali and Burichong Thanas of the Comilla district taking purposely 3 farmers from each of the 10 villages in the two areas to study the transportation facilities in the marketing of paddy and rice. The Kotwalithana was treated in the study as 'good' area and the Burichongthana as 'bad' area. For studying marketing intermediaries 20 traders were randomly selected from eight markets of the two areas. Gross output in the 'good' area was found greater in volume as compared to the 'bad' area. Traders of 'good' area operated with more capital than those of the 'bad' area. Marketable surplus accounted for

47.59 per cent of the total production in the 'good' area while the figure in the 'bad' area was 45.85 per cent. The growers of the 'good' area used tractor, rickshaw and bullock cart while the growers of the 'bad' area used rickshaw, human labour (shoulder load) and boat as means of transportation. The average transport cost in the 'bad' area was eight times higher than that of the 'good' area. In the 'good' area the growers could sell rice at any time to the beparis but the growers of the 'bad' area could not easily get beparis particularly in the dry season. In both the areas the growers who sold on the farm received lower prices as compared to the market prices. Transport in the 'good' area had more efficient capacity to move the product as compared to that in 'bad' area.

Agr.Econ.66 Islam, M. Z. 1973. **A Study on the pattern of rice marketing at farm level in a selected village under Dinajpur District.** *M. Sc. (Ag. Econ.) Thesis. Bangladesh Agr. Univ. (MS).*

This farm level study at the village Ramchandrapur revealed that about 79% of the paddy production was retained for home consumption as food and only 14% was estimated to be the marketable surplus. The largest portion of sale was reported to occur in the month of Poush (December-January); smallest amount was sold in Bhadra (August-September). Per farm average sales varied directly with the size of farm. The small farmers were found to have sold their entire marketable surplus at market centres, whereas the big farmers sold a substantial portion at home. On the average 77% of the total sales were settled at the market centre. The faria, bepari, kutials, stockists, retailers and agents of aratders and rice millers were found to operate as intermediaries at the farm level. Transportation, storage and grading were traditional and price fluctuation was observed in rice marketing during the year.

Agr.Econ. 67 Mutarais, A. 1973. **Quantitative analysis of Bangladesh Raw Jute and Jute Goods Exports and their Projections.** *M. Sc. (Ag. Econ.) Thesis. Bangladesh Agr. Univ. (MS). 94 p.*

The future of Bangladesh is very much dependent upon the foreign exchange earnings from exports of raw jute and jute goods. During the last two decades, Bangladesh has lost much of her share in the world production and export of raw jute and allied fibers made substantial progress in the field of jute goods export. This study constructed the quantitative relationship of raw jute and jute goods exports and their determining factors by single equation ordinary least square method. Data were based from 1947-48 to 1969.70. The projections of raw jute and jute goods exports were based on the past phenomena. It was found that the most important factors affecting raw jute and jute goods exports were yield per acre and production of jute goods respectively on the basis of the past observations, the export of raw jute is expected to decline slightly at the rate of 0.584 to 2.5 per cent annually, and would increase 5.024 to 5.090 per cent annually in case of jute goods exports and was also recommended that Bangladesh should increase raw jute and jute goods exports which could be effectively done by increasing yield per acre and increasing jute goods production.

Agr.Econ.68 Shahjahan, A. T. M. 1973.**A Study on Farmer's Marketable Surplus and Disposal of Rice in a Selected Village under Rajshahi District.***M. Sc. (Ag. Econ.)Thesis. Bangladesh Agr. Univ. (MS).*

A higher marketable surplus of agricultural commodities is always a national objective in an agricultural country. Rice is the most important agricultural crop in Bangladesh, but the marketable surplus of rice in the country is very meagre accounting only 9.5% of production. However, in the study area (Ghosh Nagar Village) the marketable surplus and marketed surplus of rice of 86 selected farms of different sizes were estimated to be 43% and 39 % of the production respectively during 1967-68 crop year. Size of farm and for that matter the value of production were found to have positive effect, while the volume of on farm consumption had the negative effect on the marketable/marketed surplus of rice. This indicates that in order to achieve higher marketable surplus the yield must be increased at a faster rate than the rate of increase of farming population in the country.

Miscellaneous

Agar. Econ. 69 Wader, S. A. 1960.**Village Dhanishwar-Three Generations of Man-land Adjustment in an East Pakistani Village.***Tech. Pub. No. 5, PARD Comilla.161 p.*

The study provided factual information on the current nature of ownership of land, size and distribution of holdings, the extent to which the agricultural plots have been subdivided and fragmented, the use and management of land other related problems. It tried by presenting historical data to show how the fortunes of certain land owning families have changed since 1878. Land ownership was linked to such variables as age of head of family, size of family, offspring index, illiteracy and main occupation of the family. Existing land utilization as compared to 1899, crop pattern, estimate by income from crop production were also presented. The treatment of land fragmentation was given an original approach.

Agr.Econ. 70 Masood, M. 1967.**Developing a Training Programme for Home Economics Extension Agents in East Pakistan.**

The study was undertaken to plan a training programme for home economics extension agents who will work with the village women in East Pakistan. Reviewing the social and cultural conditions, the present status of home economics extension work in East Pakistan and experiences gathered particularly in USA, two types of programmes are suggested. (i) A short term programme for the students who have a Bachelor of Science degree in home economics or a Bachelor of Arts degree. (ii) A long term programme for the students having only a high school education or below that if adequate high school educated people are not available. The trainees be liable to sign a bond to serve three to five years upon completion of the training programme. Curriculum should be flexible enough to incorporate necessary changes. Refreshers course should be an integral part of the programme. In view of the shortage of trained home economics extension agents, the training programme may begin with a one year programme with the idea of expanding to a four year programme in near future.

Agricultural Engineering

Food Technology

Agr. Engg. 1 Karim, A. L. W. Rooney. 1970. **Pentosans in grain sorghums with different endosperm characteristics.** *Annu. Meeting of the Institute of Food Technologists, San Francisco, May 24-28 (Paper No. 70).*

Pentosans are a minor but important constituent of cereal grains. Extensive work is underway on sorghum quality, but no information is available on sorghum pentosans. The purpose of this investigation was to obtain information on the content and distribution of pentosans in selected sorghum grain types which had wide differences in endosperm characteristics and processing properties. A method is described for determination of the content and distribution of pentosans in the pericarp, endosperm and germination of the sorghum kernel. The kernels were separated into the various fraction by a laboratory dry milling procedure. Varieties under investigation had a range of 2.60-5.21% pentosan content with a mean of 3.5%. Pentosan content among the same varieties grown in different locations was significantly different. The sorghum pericarp was highest in pentosan content, approximately 22%; endosperm was the lowest with approximately 1%, and germ contained 7.5%. The content to wet and dry-milling properties and physical properties of the grain.

Agr. Engg. 2 Karim, A. and L. W. Rooney. 1971. **Evaluation on the modified biuret method for determination of protein in sorghum grain.** *Annu. Meeting of the American Association of Cereal Chemists, Dallas, USA. October 10-14, (Paper No. 138).*

Forty-two samples of grain from the world collection of sorghum were selected to provide a wide range in protein content (7.0-17.0%). A linear regression equation was calculated to provide a means of relating the biuret absorbance values to protein content of the samples. Absorbance was highly correlated with kjeldahl protein content ($r=0.97$). In the second phase of the experiments an additional 42 samples of sorghum grain were analyzed for protein content by the kjeldahl and biuret methods. The protein values obtained by both methods were highly related ($r=0.93$). However, the mean content of protein determined by the biuret method was 0.3% lower than the kjeldahl protein values. The biuret method was not influenced by variation in the pericarp color on endosperm type and texture, but it was significantly influenced by sorghum kernels which had a testa. The biuret technique is a useful method for determining protein content in sorghum grain.

Irrigation and Water Management

Agr. Engg. 3 Biswas, M. R. and E. T. Smerdon. 1964. **Effect of water layer thickness on impact force of water droplets on a soil surface.** *Texas. Agr. Exp. Staion, Texas. U.S.A. DTR. No. 1.*

The data indicate that the apparent impact of an individual droplet of water is affected by the thickness of water layer through which the droplet passes and the kinetic energy of the droplet as it strikes the water surface. The impact effect of individual droplets with different masses and impact velocities can be compared by comparing their kinetic energy. While the measured impact forces in these tests are only relative, the thickness of water films necessary to protect an erodable surface from splash erosion can be conjectured. The findings are not meant to be of reasonable values for any erodable surface, rather to indicate the nature of the relationship. It remains to evaluate the effect of multiple impacts of drops with different energies such as occur in natural rainfall. The effect predicted from measurements taken with individual crops, would probably have to be adjusted somewhat. It is apparent from this study that relatively shallow layers of water over a surface offer large reductions in the impact force from falling droplets.

Agr. Engg. 4 Begum, T. 1967. **An analysis of irrigation in East Pakistan.** *Proc. 18th/19th Pakistan Sci. Conf. Jamshoro, Sec. F: Geology, 6-7.*

The necessity and feasibility of irrigation and the actual irrigation practices of East Pakistan have been described.

Agr. Engg. 5 Begum, T. 1967. **An analysis of irrigation in East Pakistan. I. An introduction with a background of irrigation.** *Proc. 18th/19th Pakistan Sci. Conf. Jamshoro, Sec. F. Geology, 1.*

The following factors were made responsible for crop failure and low output of land:

- (1) Complete dependence on natural rain plus absence of extensive irrigation.
- (2) Delay in the onset of monsoon.
- (3) Irregular rainfall in the early period of monsoon.
- (4) Variability of rainfall in full monsoon.
- (5) Absence of irrigation for intensive and extensive cultivation.

Agr. Engg. 6 Begum, T. 1967. **An analysis of irrigation in East Pakistan. II. Existing irrigation system in East Pakistan.** *Proc. 18th/19th Pakistan Sci. Conf. Jamshoro Sec. F: Geology. 1-2.*

Only 4% of the total land of East Pakistan covering an area of 1.4 million acres was under irrigation in 1965. The following five types of irrigations were practiced in East Pakistan:

- (1) Native irrigation system
- (2) Canal irrigation
- (3) Tube-well irrigation
- (4) Low lift pump irrigation, and
- (5) Rubber pipe and sprinkler irrigation.

Agr. Engg. 7 Biswas, M. R. 1967. **Estimation of water layer thickness on a soil surface to protect top soil erosion from the impact of water droplets.** *The Pakistan Engineer*, 7(9).

A layer of water would give a protection to the soil surface from erosion damage caused by the kinetic energy of water droplets. This study identified some physical significance of impacting force of such droplets with various layers of water. Conclusions to this effect can be made that a layer of water ranging from 20 to 50 mm. will disperse the impacting force caused by the droplets size of 0.07520 grams even. The analysis here in this study also indicated that maximum depth of penetration occurs with the droplet size increase in milligrams.

Agr. Engg. 8 Choudhury, M. I. 1967. **Controlled flooding for flood control.** *Proc. 18th/19th Pakistan Sci. Conf Jamshoro, Sec. F: Engineering*, 1.

Control of high floods by constructing flood embankments for most of the rivers of the country has been suggested.

Agr. Engg. 9 Choudhury, M. I. 1967. **Radial or spiral drainages for winter irrigations in the barind regions of north Bengal.** *Proc. 18th/19th Pakistan Sci. Conf. Jamshoro, Sec. E: Engineering*, 2.

The Baring region of north Bengal is typical in its formation, shape, composition and characteristics. The region offers good opportunity for production of rice if water is available from rainfall. During draught, crop fails and soil become very hard. Power pump irrigation in this region is not economic as the water table remains many hundred feet below the surface. Construction of tanks on the surface for holding water during the rainy season and supplying the same to the fields through radial or spiral drainage systems have been suggested.

Agar. Engg. 10 Mazed, M. A. and V. G. Desa. 1969. **Design and construction of whirling of shaft experimental machine.** *B. Sc. Engg. (Mech.) Thesis. East Pakistan Univ. of Engg. and Technology, (MS)*.

A machine named "Whirling of Shaft Experimental Machine" was designed, and fabricated and set up in the Heat Engine Laboratory of East Pakistan University of Engineering and Technology. The main purpose of the machine was to find out the critical speeds of shafts and other machine parts rotating at high speeds. The critical speeds are very important to be determined to keep the machines free from vibrations and consequent shortening of life them. Every machine shortening of life of them. Every machine part was designed independently by the author. The parts are cast machined in the workshops. Finally the machine was set up in the Heat Engine Laboratory. The experiment was conducted with three separate experimental rods, two of them brass rods and one, steel rod. All are of ¼ inch in diameter. The brass rods are 8ft and 4 feet in length and the steel rod is 2½ in length. The critical speeds are calculated theoretically for each of the rods and secondly they were experimentally determined with the help of the machines. The speeds determined in both the ways are very near to each other.

The three definite speeds were obtained and the limit was between 850 and 1500 rpm. The critical speeds determined in this way can help much in design purposes of shafts and other machine parts rotating at very high speed.

Agr. Engg. 11 Mohammad, G. 1970. **Development of irrigated agriculture in East Pakistan. Some basic considerations. IV. Readings in development economics no. 3: Empirical studies on Pakistan Agriculture (Hussain, S. M. and Khan, M. I., etc.).** *Pakistan Instt. of Dev. Econ., Karachi. 107-170.*

The author after studying existing irrigation projects in East Pakistan has produced evidence in this paper to suggest that

(1) Small irrigation schemes, such as low lift pumps and tube wells can be executed in a large part of East Pakistan without providing major flood protection works. Water requirements of crops for supplementary irrigation are likely to be small. (3) Although large pumps are technically more efficient, compared to small pumps, in so far utilization of fuel and the cost of pumping per unit volume of water is considered, they are more costly in so far as the cost of water delivered to the fields is concerned. (4) Although the cost of installation and operation of tube wells for each unit of water pumped is high, the actual cost of delivery of water is less than that in the case of large gravity canals fed from large pumping plants installed on the rivers. (5) Although small private low-lift pumps and small private tube wells may be less efficient in the utilization of fuel and pumping of water, as compared to large government low-lift pumps and large government tube-wells, they are more economical for their low cost, for the care taken by the farmers in using them and the economy in the use of irrigation water brought about by the farmers when they have to pay for the pump, the tube well and the fuel. (6) Irrigation schemes in East Pakistan is likely to be highly productive during the dry season when practically little cropping takes place. (7) Irrigation lays a firm ground, technically and economically, for improved farm practices, particularly for the rapid introduction of high yielding varieties and greatly expanded use of fertilizers.

Agr. Engg. 12 Biswas, M. R. 1973. **Variation of porosity and grain sizes on washing of sand filter.** *J. Institution of Engineers, Bangladesh 1(1): 25-28.*

The flow of turbid water causes clogging in the inter spaces of grains of sand filter. Washing of sand filter becomes essential to overcome difficulties from mud balls cracking and related causes for clogging. Due to washing there are porosity and gradation factor of sand filter. This investigation revealed that changes in porosity were found from 40.317 per cent to 42.360 per cent; median diameter changed from 0.142 millimeters to 0.166 millimeters and standard deviation from 1.27 to 1.19. In fact, the increases in porosity and median diameter improved the uniformity of sand as a result of reduction in gradation factor due to washing.

Agr. Engg. 13 Biswas, M. R. 1973. **Deposition of suspended solids in the aquifer due to sediment laden water recharge.** *J. Institution of Engineers, Bangladesh 1(2): 65-75.*

The sediment-laden water, characterized by suspended solids which were a mixture of 50 per cent bentonite and 50 per cent kaolinite, tested in low, medium and high concentrations in a model aquifer with fine sand. The moving front of suspended solids was different from different influent concentrations with respect to time and space in the aquifer. Suspended solids in the recharge water were filtered out in the model aquifer. Time and spatial distribution of suspended solids in the aquifer were measured. The experimental data showed exponential decrease of suspended solids in the aquifer medium during recharge. The accumulation of suspended solids near the well occurred more rapidly than in the far zone. Thus, the deposition of solids in the well divided the aquifer into two distinct zones characterized as a near-zone and a far-zone.

Animal Husbandry

Livestock

Genetics and Breeding

Ani. Husb. 1 Zalil, M. A., Q. M. F. Rahim. 1967. **Statistical study on some economic traits of cattle in Bangladesh.** *Proc. 18th/19th Pakistan Sci. Conf. Jamshoro, Sec. A:* 69-70.

Heritability and repeatability of milk production and gestation interval of 40 dairy cows of Sindhi, Haryana, Chittagong, Dacca and Pabna breeds of which 20 with two lactation records and the rest with one lactation record along with that of 48 Murrah buffalo cows have been statistically analyzed. The repeatability of milk production of *Bos indicas* was found to be 0.085 only. The repeatability of milk production and gestation interval for buffalo cows were 0.35 and 0.40 respectively, which indicated permanent difference between buffaloes. The heritability was 0.44 due to average of additive action of gene. Need for more reliable estimates of these traits to draw up a selection index is indicated.

Ani. Hush. 2 Hoque, M. 1968. **Repeatability of semen characteristics of yearling beef bulls.** *Ani. Sci. J. Pak. 1(1):* 34-38.

Semen characteristics of yearling beef bulls were evaluated at the end of a 140-day post weaning gain test. The traits considered were appearance, per cent motility, density and rating of semen. Repeatability estimates for the semen characteristics were calculated by product-moment correlations between two tests made one week apart. The pooled within breed estimates for the traits were 0.70, 0.86, 0.64 and 0.45 respectively. The results obtained indicated that a considerable part of the variation in these traits was due to permanent differences between bulls.

Ani. Husb. 3 Hoque, M. and R. J. Cooper. 1968. **Relationship between growth rate and semen characteristics in young bulls.** *Ani. Sci. J. Pakistan. 1(2):* 58-61.

A total of 154 bulls which had complete semen quality data and gain information were used to estimate within breed, within year phenotypic correlations between semen quality measurements and gaining ability. Body weight on the day of semen collection showed significant correlations with density and appearance scores. Correlation among the semen characteristics were all highly significant. This study indicates that relationships of gain with semen characteristics are very low and selection for fast gain probably will not make any change in semen quality of bulls.

Ani. Husb. 4 Rahman, M. M.; Q. M. F. Rahim, and M. Hoque. 1968. **A comparative study of the fleece yield, staple length, percentage of different types of wool fibres and fineness of wool in Local x Lohi grade-1 and East Pakistan indigenous sheep.** *Ani. Sci. J. Pakistan. 1(2) :* 52-57.

For the study 15 Local x Lohi grad-1 and 11 Indigenous ewes were taken from the University Sheep Farm. Fleece yield averaged 11.22 ounces for the graded sheep and that of indigenous sheep was 5.54 ounces. The average staple length were 2.62 inches and 2.02 inches in the graded and indigenous sheep respectively. The percentage of true wool fibres, heterotypical fibres and medullated fibres were 26.96, 16.13 and 56.78 respectively for the graded sheep while it was 19.45, 10.76, and 69.79 per cent in the indigenous sheep respectively. The average fineness of wool of the graded and indigenous sheep were 45.32 and 49.44 microns respectively.

Ani. Husb. 5 Mostafa, K. G. and Q. M. F. Rahim. 1969. **Heritability and repeatability estimates of some important economic traits in dairy cattle.** *M. Sc. (A. H.) Thesis. East Pakistan Agr. Univ. (MS).*

The study was carried out using data maintained in the Bangladesh Agricultural University Dairy Farm during the period from 1958 to 1963. Heritability estimates for milk production (first lactation yield) by paternal half-sib correlation method was 0.46 ± 0.40 and that by regression method was 0.52 ± 0.33 , for age at first effective service and age at first calving were 0.18 ± 0.28 and 0.37 ± 0.34 by intra sire regression of offspring on dam method. The repeatability estimates for milk production (within breed and ignoring breed basis) and calving interval were 0.65, 0.68 and 0.001 respectively.

Ani. Husb. 6 Rahman, M. M., Q. M. f. Rahim and M. Hoque. 1971. **A comparative study of the wool quality of Local x Lohi grade-I and Grade-II.** *Ani. Sci.J.Bangladesh. 4(1-2):9-12.*

A total of 42 ewes, 28 of grade-I and 14 grade-II were considered to study the wool quality. The average fineness of wool were 43.68 and 38.91 microns for grade-I and II respectively. The percentage of true wool fibres, heterotypical fibres and medullated fibres for grade-I were 26.93, 16.97 and 55.31 respectively and for those of the grade II were 42.72, 14.78 and 36.78 respectively. Grade II was found to be superior compared to grade I with respect to the fineness of wool fibres and percentages of different types of wool fibres.

Ani. Husb. 7 Hasan, Q.; N. A. Khan, Q. M. F. Rahim; and M. A. H. Miah. 1967. **The use of urea molasses with and without phosphoric acid for fattening of old and emaciated bullocks in East Pakistan.** *Proc. 18th/19th Pakistan Sci. Conf. Jamshoro, Sec. A: 70.*

Thirty old and emaciated deshi cattle were fattened with urea molasses with or without phosphoric acid for 106 days. The results showed that 20% and 30% urea (without phosphoric acid) and 20% urea with phosphoric acid can be used economically to replace digestible protein or its nitrogen equivalent in the ration. Better marbling and dressing percentage were found in the cattle receiving 20% and 30% urea (without phosphoric acid) and 20% urea with phosphoric acid. Cattle receiving 30% urea with phosphoric acid showed poor gain in weight and inferior meat quality. Twenty per cent urea level, and 20% urea with phosphoric acid can replace oilcakes and khesari as feed. The ration containing 20% urea without phosphoric acid

is, however, the cheapest of all the rations feed. Hence, this has been recommended for better and economic gain in body weight of cattle.

Ani. Husb. 8 Siddiqui, L. R. and M. Hoque. 1973. **A study on the breed differences and heritability of birth weight, fleece yield and staple length in sheep.** *M. Sc. (A. H.) Thesis. Bangladesh Agr. Univ. (MS).*

The study was conducted using the data maintained in the Bangladesh Agricultural University sheep farm. Highest birth-weight of 4.32 ± 1.18 lbs. in Native x Lohi grade II and lowest of 3.33 ± 1.16 lbs. in Native x Kachhi grade II with production of wool from 208.83 gm. in Native to 611.44 gm. in 3rd generation of Native x Lohi and 59, 95, 193 and 103% improvement in wool production in first, second, third generations of up-graded Lohi and first generation of up-graded Kachhi respectively were obtained over native sheep. Average highest staple length of 2.97" and lowest of 2.02" in native x Lohi grade II and in Native with 44.47% improvement over the Native, and Native x Kachhi-I produced 38% longer fleece with up-graded Lohi showing 6% increase in staple length over the up-graded Kachhi. Analysis of variance showed significant difference between grades ($P < 0.05$). Heritability estimates for birth-weight, fleece yield and staple length on the basis of paternal half-sib correlation method were 0.415 ± 0.606 ; 0.281 ± 0.403 and 0.316 ± 0.408 respectively.

Nutrition and Feeding

Ani. Husb. 9 Razzaque, M. A. and W. C. Ellis. 1966. **Ion exchange method for determination of urinary purine and creatinine.** *J. Ani. Sci. 25: 896.*

Analytical method for urinary purine derivatives are colorimetric methods of relatively low specificity developed for monogastric urine. An ion exchange method for the separation and ultraviolet spectrophotometric determination of allantoin, uric acid, xanthine, hypoxanthine, guanine and adenine as well as creatinine in ruminant urine has been developed. Purines and creatinine are retained on a cation exchange column in the hydrogen form (Ag 50W-x12) and the eluted oxidized purine forms, along with hippuric and other acids, are absorbed on a basic anion exchange column (Ag 1-x10). The cation exchange column is then gradiently eluted with 0.1 to 4.5 hydrochloric acid resolving xanthine, hypoxanthine, creatinine, guanine and adenine. Fractions are collected and composited, and components are determined by ultraviolet spectrophotometry at appropriate wave-lengths. The anion column, previously equilibrated with buffer (0.1 M ammonium hydroxide and 0.025 M ammonium chloride), is gradiently eluted with increasing ionic strength and reducing pH. Pure standards were quantitatively recovered and their ultraviolet absorption spectra were compared with similar fractions obtained from sheep urine similarly chromatographed. Urinary fractions were, with the exception of allantois, spectrophotometrically identical with the pure standards similarly chromatographed.

Ani. Husb. 10 Momen, M. A. and H. Rahman, 1968. **Effect of different levels of nitrogen along with phosphorus and potassic fertilizers on some mineral composition of pangola grass (*Digitaria decumbens* Steet).** *Ani. Sci. J. Pakistan. 1(2): 1-9.*

The ratio of K/Ca+Mg increased with the application of fertilizers except in few cases, indicating mineral imbalance which may cause tetany. But, when considered the ratio of K + Ca/Mg, the ratio increased only in those grasses dressed heavily with nitrogen fertilizers with PK especially N₃ PK and N₄ PK excepting one or two cases where other treatments showed increments of the ratio. The reasons of treatment variations could not be explained. The K to Na ratio remained within the normal limits.

Ani. Husb. 11 Mursheduzzaman, M. and M. S. Rahman. 1968. **Bone meal in cale rations.** *Ani. Sci. J. Pakistan. 1(1): 54-56.*

In the growth study with 9 baby calves in a completely randomized block design the average monthly total gains in body weight were 27.3, 30.7 and 47.3 lbs. with zero per cent, one per cent and two per cent of steamed bone meal respectively. The gain on two per cent was significantly different from those on one per cent and zero per cent, but the difference in gain on one per cent and zero per cent was not statistically significant. It was concluded that calcium and phosphorus supplement was required for growth and two per cent level of steamed bone meal was superior for growth and two per cent level of steamed bone meal was superior for the purpose.

Ani. Husb. 12 Razzaque, M. A. 1968. **Relationship between intra ruminal protein and nucleic acid synthesis.** *Proc. 20th All Pakistan Sci. Conf. Dacca. 55.*

The experimental approach taken in this research was to correlate the synthesis of microbial protein and nucleic acid. Rumen cannulated sheep were feed semipurified diets essentially free of purines containing N supplement either urea or zein. Rumen samples were chemically fractionated to microbial protein nitrogen and microbial nucleic acid purines. Analysis of the semipurified ration revealed them too essentially devoid of adenine and guanine. The purine determined in the rumen digesta represented purines synthesized by the rumen micro-organism. A highly significant relationship was observed ($r=0.83$, $P<0.01$) between digesta concentrations of microbial protein nitrogen and the total purine. It might be concluded from this observation that their relationship between microbial protein and nucleic acid purines might lead to a better quantitative estimation of microbial protein synthesis.

Ani. Husb. 13 Rouf, M. A. and M. A. Razzaque. 1968. **Effect of urea-molasses supplement of nitrogen digestibility by sheep.** *Ani. Sci. J. Pakistan. 1(2): 16-23.*

A comparative digestion trial was conducted with 14 sheep of approximately 1 year age and 20 to 40 lbs. body weight. The animals of group A receive a basal diet of 227 gm. para grass hay, 227 gm. wheat bran and 75 gm. molasses supplying 9.46% crude protein. Group B, C and D received 5, 10, and 15 gm, urea respectively in addition to common basal ration. The animals of group B received 11.69% crude protein from the total ration and 19.67% of the total crude protein received from urea and remaining 80.33% from the vegetable source. The ratio of urea nitrogen to vegetable protein nitrogen was 1:4.08. The animals of group C

received 13.87% crude protein in the total ration and only 32.87% of the total crude protein was given from urea and remaining amount from the vegetable source. The ratio of urea nitrogen to basal ration nitrogen in group C was 1:2.04. The animals of group D received 1.00% crude protein in the total ration and 42.37% of the total crude protein was given from the vegetable source. In this group ratio of urea nitrogen to basal digestibility of crude protein of the control animals which received no urea in their ration had 75.29%. The other 3 groups of animals which received 5, 10 and 15 gm urea were found to have digestibility of crude protein 80.73%, 84.82% and 82.76% respectively. The average digestibility of dry matter in control group was 73.18%. In other 3 groups which received 5, 10 and 15 gm, urea, the digestibility of dry matter was 79.21%, 80.48% and 81.35% respectively. It was found that 10 gm. urea when added to the ration increased the digestibility to the maximum but when 16 gm. urea was used, it reduced the digestibility of crude protein. It was concluded that 10 gm. urea of 32.87% urea crude protein of total crude protein in the ration of sheep per day is the optimum amount that will give the best result.

Ani. Husb. 14 Saadullah, M. and A. Quddoos. 1968. **Effect of supplementation of vitamin A, D, E and bone meal in the ration of sheep in improving the live weight gain and carcass weight.** *Ani. Sci. J. Pakistan. 1(2): 10-15.*

The experiment was conducted for a period of 62 days to study the effect of supplemented vitamin A, D, E in different doses and steamed bone meal in the ration of sheep in improving the live weight gain, carcass quality and quantity. Sixteen sheep of approximately same age, body weight and breed divided in to 4 groups received isonitrogenous and isocaloric ration. The basal ration was composed of road-side grass bran and til oil cake in the ratio of 9:1 and the treatment groups received different doses of vitamin A, D, E and fixed doses of steamed bone meal. Average body weight gain in the four groups was 4.5, 7.0, 4.25 and 5.25 lbs. respectively and average feed consumed per pound of body weight gain was 14.34, 9.00, 12.77 and 10.98 with dressing percentages of 46.00, 43.47, 43.75 and 42.82 respectively. Better flavour, tenderness, texture and color were tested in the mutton of treatment groups D and B only.

Ani. Husb. 15 Zaman, M. M. and M. S. Rahman. 1968. **Bonemeal in Lactating Buffalo Rations.** *Ani. Sci. J. Pakistan. 1(2): 62-66.*

The effect of feeding steamed bone meal at different levels to lactating buffaloes as a source of calcium and phosphorus was studied in this experiment with 9 (nine) lactating buffaloes in 3 x 3 Latin square design. Cows produced an average of 9.6, 10.5 and 14.0 lbs. of solid corrected milk daily by consuming concentrate mixture with 0.0%, 1% and 2% steamed bone meal respectively. Analysis of variance showed statistically significant difference in solid corrected milk production on 2% level of bone meal from the other with no statistically significant changes in milk fat and total solids. The average daily losses of body weight were 16.0, 10.3 and 3.6 lbs. on three treatments respectively with significant difference between treatment means. It was observed that calcium and phosphorus were needed for milk production and 2% was superior to 1% levels.

Any. Husb. 16 Chowdhury, A. M.; M. Haque; A. Quddoos; A. Razzaque; A. Rouf and M. Hoque. 1968. **Coparative study of the effect of four different types of fat on the growth pattern of goats.** *Ani. Sci. J. Pakistan.* 2(1): 78-85.

Twenty goats randomized into five groups with one as control, were fed with four different oils such as soybean oil, groundnut oil, till (sesame) oil and mustard oil with the basal ration. The requirement of oil per animal was determined to be 20 cc. and was added to respectively ration. The result revealed that the group fed with soybean and groundnut oil, consumed more feed. Highest gain in body weight was observed in soybean group in comparison with the rest.

Ani. Husb. 17 Dey, N. and M. S. Rahman. 1969. **Limited roughage in dairy cattle feeding practice.** *Ani. Sci. J. Pakistan.* 2(1): 49-55.

Different levels of roughage were compared in a feeding experiment with nine lactating cows. The average daily fat corrected milk produced by cows fed 2%, 1% and 0.5% hay equivalent was 6.9, 6.6 and 4.2 lbs. respectively. The average per cent of milk fat, solids-not-fat were 5.2 and 8.7 and 2.9 and 8.7 respectively by feeding the above hay-equivalents. The average daily milk production and fat test obtained from feeding 0.5% hay equivalent was significantly different from those obtained by feeding 1% and 2%, hay equivalents. The daily loss or gain in body weight were -2.5, -3.5 and -3.5 lbs. on three treatments with no significant difference. The relative feed and labour cost per pound of fat-corrected milk was Tk. 0.17, 0.16 and 0.22 respectively on three treatments with 1% hay equivalent feeding, being lowest. It is economical to feed limited roughage if a certain minimum level (1%) in the ration is to be maintained.

Ani. Husb. 18 Hossain, M. A., A. K. M. A. Mannan and M. S. Rahman. 1969. **Average percentage of fat total solids and solids-not-fat contents of local cow's milk and the variations of milk fat percentage with the stage of lactation, milk yield and number of lactation.** *Ani. Sci. J. Pakistan.* 2(1): 37-38.

Three hundred fifty milk samples of individual local cows were collected and analyzed. The average percentage of fat, solid-not-fat and total solids in the milk of local cows of three groups viz. 2 lbs., 2-4 lbs. and above 4 lbs. were 4.70, 8.95, and 13.65 ; 4.57, 1.90 and 13.47 and 4.49, 8.87 and 13.36 respectively with standard deviation of 4.60 ± 0.640 , 8.91 ± 0.256 and 13.51 ± 0.896 . The variations in the fat % with stage of lactation, the influence of milk yield on fat content and effect of lactation on milk fat content were studied. The average percentage of milk fat was observed 4.62% in the first month and after that it decreased to 4.34% in the 3rd month and then it increased slowly followed by rapid increase to 5.17% in the eleventh month. The average fat % was found to decrease gradually with increase in daily milk yield with a coefficient of correlation between fat % and yield being -0.327 and regression of average fat % on daily milk yield being 0.0547 and of that on number of lactation being 0.088.

Any. Husb. 19 Quddoos, A. and A. M. M. Tareque. 1969. **Effect of urea feeding in ruminants in different combination of feed ingredients.** *Ani. Sci. J. Pakistan.* 2(1): 7-15.

An experiment was conducted with 30 calves of both sexes divided randomly into 10 groups of three each in E. P. Agricultural University, Mymensingh with the objective to see the effect of different feed combination in the utilization of urea, to know the optimum doses of urea in the local calves and to study the feasibility of replacing molasses by sweet potato in the utilization of urea in ruminants. Results obtained in this experiment, indicated better utilization of urea in a mixture of rice polish, wheat bran and til cake in addition to rice straw and urea molasses with a body weight gain 0.929 lb.day/head in comparison with other groups proving better utilization of urea. It was also concluded that at dose of 45 gms. of urea i.e. 30.6% of total ration nitrogen in urea form is the optimum quantity for ruminant of about 200 lbs. body weight.

Ani. Husb. 20 Saadullah, M. and A. Quddoos. 1969. **Effect of supplementing bone meal and vitamin A, D and E in the ration of sheep on the digestibility of crude protein and dry matter.** *Ani. Sci. J. Pakistan.* 2(1): 1-6.

A digestion trial was conducted for seven days to study the effect of supplementing bone meal and different doses of vitamin A, D and E in the ration of sheep on the digestibility of crude protein and dry matter. The coefficient of digestibility of crude protein and dry matter in the group A (control), group B, C and D (fed with different levels of vitamin was 55.58, 56.51, 60.56 and 56.26% and dry matter digestibility was 58.92, 58.94, 59.52 and 58.55% respectively. It was concluded that supplementation of vitamin and minerals to a ration with poor vitamin and minerals seem to favour more digestibility of crude protein and dry matter, although the results obtained were not significantly different.

Ani. Husb. 21 Hakam, M. M. and M. S. Rahman. 1970. **Groundnut oil cake in lactating buffalo rations.** *Bangladesh J. Ani. Sci.* 3(1-2): 12-17.

Mustard oil cake, til oil cake and groundnut oil cake were compared in a feeding experiment in which 9 Murrah buffaloes were used in a 3 x 3 Latin square design. The average daily Solid Corrected Milk (SCM) production of buffaloes fed the cakes were 15.95, 15.88 and 19.49 lbs. respectively with a significant difference among them. The Duncan's Multiple Range Test indicated that daily SCM production on groundnut oil cake was significantly higher than others. The average percentage of milk fat and total solids were 7.07 and 15.88 on mustard oil cake, 7.09 and 16.22 on til-oil cake and 7.45 and 16.32 on groundnut oil cake respectively with no significant difference. But the difference in the average body weight gain during the experimental period was statistically significant.

Ani. Husb. 22 Miah, A. H. and A. Quddoos. 1970. **Standards and standardization in the manufacture of Dacca cheese-I. Standards of commercial Dacca cheese.** *Ani. Sci. J. Bangladesh.* 3(1-2): 33-38.

After surveying the Dacca cheese making areas in Austogram five cheese samples were collected and analyzed. The cheeses were found to contain 39.5% fat, 5.12% salt and 60.7%

total solids. The total bacterial count was found to be 400,000,000/gm., after incubating for 120 hours at 20°C in plate count agar. The variety of cheese falls within the range of hard variety rather than semi-solid variety as was commonly believed.

Ani. Husb. 23 Manna, A. K. M. A.; M. M. Rahman; M. A. H. Miah and M. S. Rahman. 1971. **Studies on the total bacterial population and their morphological identification in milk drawn directly from the cows udder.** *Ani. Sci. J. Bangladesh.*, 4: 5-8.

The extent of bacterial population in raw milk drawn aseptically and under unsanitary condition from the local dairy herds were studied. The results indicated that the milk taken aseptically from cows showed low bacterial count whereas the milk drawn under unsanitary condition from the same cows revealed exceedingly high bacterial count/ml. of milk. The types of organisms present in the milk samples were determined. The microscopic examination indicated the presence of a few types of organisms i.e. gram positive cocci and gram negative rods in milk drawn under aseptic condition while milk drawn under poor sanitary condition contained all types of micro-organisms such as gram positive and gram negative rods and gram positive and gram negative cocci. This indicated that to produce clean, wholesome or high quality milk in a dairy herd the cows along with their attendants should be clean, healthy and free from all types of diseases. Clean and pure water with sterilized utensils to be supplied and used in handling, distribution and processing of milk and milk-products. The raw milk must be cooled to 10°C or less immediately or within two hours.

Ani. Husb. 24 Miah, A. H. and M. A. Quddoos. 1971. **Standards and standardization in the manufacture of Dacca cheese-II. Effect of manufacturing.** *Ani. Sci. J. Bangladesh.* 4: 23-31.

In this experiment a total of 24 blocks of cheese were made from 560 lbs. of fresh milk by using commercial lactic culture and Hensens commercial rennet. Two vats of cheese were prepared under identical condition at a time. Two methods of hooping i.e. squeezed and unsqueezed, and two methods of salting i.e. plugging salt in the centrally bored holes and sprinkling in the hoops as the curds were filled; were studied. The squeezing of curd before hooping reduced moisture content, while moisture content was higher where sprinkling method of salting was used although a portion of salt was lost along with whey but no salt was lost when applied through centrally bored holes; rather cheese salted in the holes had higher flavour scores. The differences in the salt content of cheese among different treatments were highly significant and the methods of salting greatly influenced the distribution and retention of salt in cheese. The flavour scores of cheese with high salt was higher while salted by sprinkling was criticized for gassiness, bitter, rancid and putrid flavour.

Ani. Husb. 25 Hassan, M. N. and A. H. Miah. 1972. **A study on starter cultures for manufacture of "Dahi" preferred in Bangladesh.** *M. Sc. (A. H.) Thesis. Bangladesh Agr. Univ. (MS).*

Local curd (dahi) samples were examined to study the microorganisms involved. The organisms found were *lactobacilli* and *streptococci* on the basis of morphological study, litmus milk characteristics, coagulation time, catalase test and activity tests. *Lactobacilli* in

general required less time for coagulation than that of *streptococci* and total lactic acid production of *lactobacilli* ranged from 0.70 to 1.48 per cent in 24 hours. Curd prepared with different levels of added milk solids irrespective of cultures used, had better body and appearance with 10-12% solids and was liked by most judges. The ratio of *lactobacilli* to *streptococci* had a definite effect on the flavour and total acidity of curd. Curd inoculated with two or more *streptococci* and one *lactobacilli* or two more *streptococci* with a flavour culture, gave better flavour. The results obtained indicated that a good quality curd can be produced by addition of milk solids to give most desired body and appearance. A ratio of two or more *streptococci* to one *lactobacilli* would give better results.

Ani. Husb. 26 Mondal, M. N. A. and M. S. Rahman. 1972. **Effect of synthetic hormone on growth performance in castrated and uncastrated Sahiwal male calves.** *M. Sc. (A. H.) Thesis. Bangladesh Agr. Univ. (MS).*

The effects of a synthetic hormone, Ethinyloestradiol B.P. (Lynoral) on growth performance of uncastrated and castrated Sahiwal male calves in terms of gain in body weight, height at withers and girth measurement were studied in this experiment with 12 Sahiwal male calves divided into 4 groups for a period of 18 weeks at the Bangladesh Agricultural University Dairy Farm. The animals of groups A and C were balanced as far as practicable in respect of age, live weight and general health and fed a basal ration of wheat bran, fish meal, urea-molasses, bone meal and common salt as concentrate mixture and rice straw as roughage while that of B and D were fed basal ration supplemented with the synthetic oestrogen. The average weekly gains in body weight were 4.70, 6.43, 5.15 and 6.66 for groups A (uncastrated and untreated), B (uncastrated and treated), C (castrated and untreated) and D (castrated and treated) respectively. The differences of weight gains in groups were significant. The costs of feed and hormone required per lb. of body weight gain were Tk 2.18, 1.94, 1.99 and 1.85 respectively for groups A, B, C and D. Findings indicated that animals treated with synthetic oestrogen gained more weight at cheaper cost and thus synthetic oestrogen has an economic advantage for fattening of male calves.

Ani. Husb. 27 Razzaque, M. A. and J. H. Topps. 1972. **Utilization of dietary nucleic acids by sheep.** *Proc. Nutr. Sco. 31: 105A - 106A.*

Two lambs which were 5-6 months of age and provided with abomasal cannulas, were used in measuring both the apparent digestibility of RNA or DNA added to a diet with a high content of starch and the effect of each nucleic acid on the digestibility of certain dietary constituents. Each lamb received daily 600 gm. flaked maize, 200 gm. dried grass, 200 gm. hay and 70 gm. fish meal followed by the same diet plus 5 gm. of either RNA or DNA. Faeces and abomasal digesta were collected and sampled during the last week on each diet, and these samples, along with the foods, were analyzed for RNA and DNA. Despite large differences between the three diets in intake of RNA and DNA, the faecal excretions and contents of abomasal digesta were relatively constant. These results support previous findings that dietary nucleic acids are degraded in the reticulorumen and the microbial nucleic acids synthesized in that

part or the gut are highly digestible. The addition on either RNA or DNA to the basal diet apparently caused a large increase in the proportion of the fibrous constituents digested. Similar results have been obtained when digestibility of cellulose in a hay sample was measured *in vitro* over 24 h. The addition of very small amounts of either RNA or DNA to the system increased digestibility from 28.4% to either 48.4% or 44.4% respectively. The addition of either RNA or DNA to the diet appears to stimulate the activity of cellulolytic micro-organisms in the reticulo-rumen, an effect which may be useful in overcoming the depression in activity that is frequently found with diets rich in starch.

Ani. Husb. 28 Razzaque, M. A. and J. H. Topps. 1973. **Determination of hypoxanthine, xanthine and uric acid in ruminant's urine.** *Proc. Nutr. Soc.* 32: 58A - 59A..

Ruminants excrete considerable quantities of the purine derivatives hypoxanthine, xanthine, uric acid and allantoin, most of which come from microbial nucleic acids synthesized in the reticulo-rumen. Methods used to determine these compounds other than allantoin are either subject to interference from other urinary constituents or involve radioisotopes. Recent work has shown that the pattern of excretion of purine derivatives differs between certain species, and the analytical procedure is based on a two-stage ion-exchange chromatographic separation of purines using the resins AG 50W x 4 (00-400 mesh) in the hydrogen form and AG 1W x 10 (50-100 mesh) converted into the acetate form (Bio-Rad Laboratories, California, USA), followed by enzymatic conversion of hypoxanthine and xanthine to uric acid and of uric and of hypoxanthine + xanthine were 95-98 and 88-99% respectively.

Ani. Husb. 29 Razzaque, M. A., J. H. Topps, E. D., Goodall, and R. N. B. Kay. 1973. **Metabolism of nucleic acid by sheep and red deer.** *Proc. Nutr. Soc.* 32: 59A - 60A.

In earlier studies it was observed that sheep excreted more urinary allantoin and uric acid than red deer. We have now re-examined this difference to see if it could be related to the production of nucleic acids in the rumen. Two sheep and one deer, all fitted with rumen cannulas, were housed in metabolism cages and given a pelleted diet consisting largely of barley straw, maize starch and groundnut meal and containing 26.3 gm, nitrogen/kg. This diet was delivered from a continuous feeding device at either 0.9 or 1.8 of their maintenance level of nutrition. The concentrations of nucleic acids in the rumen contents of the two sheep and the deer were estimated and were found to be similar, averaging 132, 115 and 172 gm. nucleic acid N/L respectively. Later, when the animals and another red deer were given a diet of pelleted dried grass, values of 40, 40 and 35, and 70 mg. nucleic acid N/L recorded. The sheep excreted approximately 50% less nucleic acid in their faeces than the deer but the amount was related to the amount of food consumed and to the excretion of faecal N (47.9, 40.9 and 49.3 mg. nucleic acid N/gm. faecal N respectively). Despite these similarities in nucleic acid production excretion of purines in the urine differed greatly between sheep and deer. The results indicate that the sheep and deer differed in their catabolism of purines rather than in the microbial synthesis of nucleic acids.

Reproduction and Artificial Insemination

Ani. Husb. 30 Hoque, K. M. and M. A. Hasnath. 1966. **A comparative study of the relative merits of the extenders containing egg yolk-citrate, skim milk and skim milk glycerol for maintaining motility of bovine sperm at 5°C.** *M. Sc. (A. H.) Thesis. East Pakistan Agr. Univ. (MS).*

Average motility of sperm after 4 days storage was 67.5%, 66.5%, 56.5% and 56.75% in duck egg-yolk-citrate, hen egg-yolk-citrate, skim milk-glycerol-citrate and skim milk respectively with no significant difference, among the dilutors. After 8 day's storage: all extenders maintained statistically equal sperm motility but the former two maintained higher motility compared to the rest. After 12 days storage: the duck and hen egg-yolk-citrate were not different but each maintained sperm motility significantly higher ($P < 0.01$) than both skim-glycerol and skim. Duck and hen egg-yolk-citrate maintained 50% sperm motility for significantly longer duration.

Ani. Husb. 31 Hasnath, M. A. 1967. **Motility of bovine spermatozoa following storage at 5 and - 196°C in extenders containing fresh and reconstituted skim milk.** *Proc. 18th/19th Pakistan Sci. Conf. Jamshor Sec. A : 68 p.*

In the fresh skimmed milk number of motile sperms decreased from 34 million/mm. to 10 million/mm. in 10 days, while in the reconstituted skimmed milk motile sperm number was maintained at 10 million/mm. for 5-10 days. The average post thaw concentration of motile sperm numbers was 20 million/mm. in fresh skimmed milk glycerol and 19 million/mm. in reconstituted skimmed milk glycerol. At 5°C storage temperature, motility of sperms was more persistent in fresh skimmed milk than in the reconstituted skimmed milk glycerol.

Ani. Husb. 32 Ali, S. Z. and M. Hoque. 1969. **A study on the preservation of bovine semen at room temperatures.** *M. Sc. (A. H.) Thesis. East Pakistan Agr. Univ. (MS).*

Four diluents namely coconut milk-sodium-citrate, coconut milk-egg-yolk; glucose-citrate, Cornell University-16 were employed to maintain motility of bovine sperm at room temperatures. After 24 hours of preservation 44, 44, 56 and 62% motility were maintained by the extenders respectively. After 72 hours the motility fell down to 8, 20, 27, and 44% as against 50% in control at 5°C in Egg-yolk-citrate. Significant difference was observed among diluents with a correlation of 0.53 between pH and motility after 24 hours of storage while the room temperature and the sperm motility was negatively correlated. Cornell University-16 maintained better sperm motility at room temperatures up to 48 hours.

Ani. Husb. 33 Hashem, M. A. and M. Hoque. 1969. **Influence of extenders containing egg-yolk-citrate, egg-yolk-phosphate, skim-milk and skim-milk glycerol in maintaining motility of ram semen at 5°C.** *M. Sc. (A. H.) Thesis. East Pakistan Agr. Univ. (MS).*

The average sperm motility after 24 hours of storage in Egg-yolk citrate, Egg-yolk phosphate, skim milk with 10% glycerol, skim-milk with 5% glycerol and that with 2.5% glycerol was

72, 70, 71, 59, 69, and 70% respectively. After 48 hours they were 62, 55, 60, 45, 59 and 60%, respectively with significant difference among diluents. Egg-yolk phosphate and skim milk with 10% glycerol extenders were found inferior to others while Egg-yolk-citrate and skim milk maintained better sperm motility than others.

Ani. Husb. 34 Rahman, M. M. and M. Nasim. 1969. **Effect of season on goat semen characteristics and its fertility in Bangladesh climate.** *M. Sc. (A. H.) Thesis. East Pakistan Agr. Univ. (MS).*

Highest conception rate of 47.62% was obtained in post monsoon followed in order by winter (40.50% conception) and the variation in semen characteristics was attributed to the influence of season.

Ani. Husb. 35 Wahiduzzaman, M. and M. Nasim. 1969. **A study on seasonal variation semen characteristics and fertility of bulls under Bangladesh condition.** *M. Sc. (A. H.) Thesis. East Pakistan Agr. Univ. (MS).*

Significant variation in concentration and initial motility was observed in different seasons and the best quality semen was found in winter and next in order in post-monsoon, pre-monsoon and monsoon. Maximum number of cows (78.76%) conceived by the semen collected and used in winter, next in order was 71.33% in post-monsoon, 63.39% in pre-monsoon and 52.62 in monsoon season.

Ani. Husb. 36 Hoque, M., M. A. Hashem and Q. M. F. Rahim. 1970. **Study on the seasonal variation in semen characteristics of Lohi Rams under local environmental conditions of Bangladesh agricultural University Sheep Farm.** *Ani. Sci. J. Bangladesh. 3(1-2): 1-5.*

The study was conducted with seventy five ejaculates collected from three Lohi Rams using artificial vagina method. Best quality semen was produced during winter with an average volume of ejaculate 1.2 cc., pH 6.9; initial motility 91.2% and sperm count 3.9 billions/cc. This was followed by the spring season and the poorest quality being obtained during the rainy season with average volume 0.9 cc.; pH 6.8; initial motility 84.0%; abnormality 25.3% and sperm count 5.2 billions/cc. High temperature and high relative humidity, have apparently affected both spermatogenesis and motility of spermatozoa.

Ani. Husb. 37 Nasim, M., M. M. Rahman, M. W. Zaman and M. Shamsuddin. 1971. **Study on conception rate by artificial insemination among cows of different psychic conditions.** *Ani. Sci. J. Bangladesh. 4(1-2): 48-51.*

Conception rate by artificial insemination in three groups of cows were noted for psychic conditions viz. (i) quiet, (ii) moderately nervous and (iii) nervous and the rates were 62.55%, 58.59% and 46.52% respectively. The nervous and restless cows were poor in conception rate indicating that secretion of hormone, oxytocin by posterior pituitary is checked by nervousness. As a result movement of uterine muscles at the time of insemination is diminished or stopped and sperms fail to reach fimbria in time.

Ani. Husb. 38 Ali, M. A. and M. A. Hasnath. 1972. **The effect of winter season on semen quantity and function of testicular tissue elements of crossbred rams.** *M. Sc. (A. H.) Thesis. Bangladesh Agr. Univ. (MS).*

Volume, motility, concentration, live-dead and abnormality of semen samples better than that produced by Rams placed in the open atmosphere during October to November. Proliferation of the cells of seminiferous tubules occurred more in closed chamber. Winter temperature did affect characteristics of semen samples while high environmental temperature did affect spermatogenesis in ram.

Miscellaneous

Ani. Husb. 39 Ali, M. A. and S. M. Fatima. 1967. **Gravimetric study of yield and medullation of Bibrik wool.** *Pakistan J. Sci. Ind. Res. 10: 74-76.*

A wool sample representative of Bibrik fleece was sorted into true, heterotype and kemp fibres. Although it gave high propor of kemp fibres, the classification was justified by measurement of fibre length, density and medullation. Analysis further suggested that malnutrition of sheep may accentuate inherited tendency of fibre medullation.

Ani. Husb. 40 Ali, M. A. and S. M. Fatima. 1967. **Relationships of medullation to fineness and toughness of wool fibres from a fleece of bibrik wool.** *Pakistan J. Sci. Ind. Res. 10: 216-222.*

In addition to the correlation of medullation, fineness and toughness, the ratio of the number of true fibres to the number of both heterotype and kemp fibres taken together has been shown to represent the proportion of secondary to primary follicles in a fleece or its S/P ratio which is an index of wool quality.

Ani. Husb. 41 Ali, M. A. and S. M. Fatima. 1967. **Medulation, fitness and strength characteristics of the heterotypical fibres of Bibrik wool.** *Pakistan J. Sci. Ind. Res. 10: 68-73.*

The turnable knob for the to and fro motion of slide clips in a Reichert microscope was graduated to measure the length of medullary fragments inside each fibre. Analysis of the significant correlations between fibre diameter and breaking force, between diameter and medullation, breaking stress and cross-sectional area, and between medullation and toughness shows that fibre medullation which is attributable to nutritional stress, genetic propensity and old age senility, may unfavourably effect processing efficiency and durability of the wool assemblies.

Ani. Husb. 42 Mannan, A. K. M. A. 1968. **The occurrence of psychrophilic bacteria on dairy barn's water.** *Ani. Sci. J. Pakistan* 1(1): 65-73.

The turbidity test in tryptose broth incubated at 5°C for 1-4 days with plate count agar incubated at 5°C for 7 days on 43 barn's water sample was recorded for Psychrophilic bacteria. Physical changes in 9 sterile skim milk inoculated with colonies of Psychrophiles and the flavour defects caused by them were valued. The temperature used for incubation at 5°C and 10°C were not suitable for proper growth of Psychrophiles with 5°C being lower and 10°C being higher although 7.2°C that might be suitable, could not be tried. More than 34 producers' water supply were very good, and meeting the requirement for barns and plant water supplies.

Ani. Husb. 43 Ali, M. A. 1970. **Natural variation of regain between merino and non-merino wools.** *Pakistan J. Sci. Res.* 22: 35-36.

An observed difference of (at least 1%) moisture regain between the indicated two wool-types may arise from their relative variation of fibre crystallinity in agreement with greater uniformity of Merino wool fibre.

Ani. Husb. 44 Ali, M. A. 1970. **Interrelatedness among natural variations on the carpet wools.** *Pakistan J. Sci. Ind. Res. (MS. No. 1103).* 6 p.

Metrological study of the mixed carpet wools reveals high correlations between industrially significant fibre attributes. Thereby, implying a confounding tendency of the specific compressional load, sulphur content and bundle tenacity in their effects on clean fibre yield. Cogent physical interpretation of their relationships agrees with the fact that the correlations of sulphur content with specific load and tenacity differ in sense from those observed in the nonmedullated wools.

Ani. Husb. 45 Ali, M. A. 1970. **Preliminary observations on loose wool felting together with its follow-up study.** *Pakistan J. Sci. Ind. Res. (MS 1138).* 10 p.

It shows significant effects of jar-positions on a shaker, viscosity and volume of felting as well as of interaction between breed and liquor volume on the felting rate of loose wools. Whilst these effects primarily suggest the paramount role of compressive force in determining loose wool felting rate, the fibre thickness and elasticity also appear to be important parameters. Further analysis by using a new method developed here indicates considerable difficulty of predicting felting rate from observations at the preceding stages of manufacture.

Ani. Husb. 46 Ali, M. A. 1970. **Ply effect on yarn shrinkage due to relaxation and felting.** *Pakistan J. Sci. Ind. Res.* 13: 470-476.

Although ply twist may not significantly affect it, the relaxation shrinkage of worsted ply increases with the number, twist factor and tex, the ply number accounting for 99.9% of the variations in the relaxation. In addition ply felting shrinkage usually decreases with high ply

number, especially when even. This effect of ply number may resemble that of twist factor rather than tex. Finally, a large difference of felting rates has been noted between 1 and 2-ply woollen and worsted yarns of various wools.

Ani. Husb. 47 Ali, M. A. 1970. **Mechanisms of wool shrinkage in fabric, yarn and loose wool.** *Pakistan J. Sci. Ind. Res.* 13: 310-315.

This analysis reveals two diverse mechanisms of wool felting which are attributable to the difference in degrees of freedom normally associated with the types of fibre movement. The initial rapid felting rate of knitted fabrics, which is significantly correlated with yarn tex (mass per unit length) and tenacity, varies inversely with fibre crimp ratio, yarn twist and fabric cover factors. Although they may be modified by interaction with an assembly geometry, the same fibre characteristics govern wool felting at all stages of processing. Besides, tightness of fabric structure may increase relaxation shrinkage but it is unlikely to cause Shorters's mechanism prevalent in the final slow felting rate.

Ani. Husb. 48 Haque, M. H. and A. B. M. F. Wahed. 1970. **A study on the defects of flaying and curing of hides and skins as a rural industry in Dacca.** *M. Sc. (A. H.) Thesis. East Pakistan Agr. Univ. (MS).*

In 757 hides percentages of deep knife cuts was 32, shallow knife cuts was about 56, other defects were about 84%. Average time for flaying was about 15 minutes by butchers. Unskilled flayers, sharp country made tools, slaughtering of pootand exhausted animal, unclean slaughter house were the factors of making common defects of hides. Rock salt and naphthalene in combination was the best of all preservatives used in this research. Tick damages were quite high, unsystematic start of curing the hides, poor storing, unsystematic grading the carelessness in handling were the factors of the extreme damage of the hides.

Ani. Husb. 49 Ali, M. A. 1971. **The comparative influence of single fibre crimp configuration on the bulk modulus of elasticity of wool fibre ensembles.** *Pakistan J. Sci. Ind. Res.* 14: 150-158.

With the help of a new technique this study illustrates relative significance of crimp parameters and other wool properties in determining the bulk modulus or compressibility of a wide variety of raw wools. The behaviour of natural twist arising from the rotation of fibres major/minor axis, which also results in tiny primary and large secondary crimp waves, appears to be similar to that of yarn spinning twist even though natural crimps are differentially modified by the spinning twist.

Ani. Husb. 50 Ali, M. A. 1971. **Technological significance of crimp configuration in wool fibre.** *Pakistan J. Sci. Res. (MS. No. 109-70/191).* 8 p.

Measurements on raw wools of Pakistan and Australia show incompatibility of a theory of crimping in wool fibre as periodic function of time and independent of fibre growth rate. The

variation of crimp configuration, though significantly correlated with fibre growth rate and sulphur content, accounts for most of the variation in felting rates.

Ani. Husb. 51 Ali, M. A. 1971. **Characteristics of loose-wool compressibility.** *Pakistan J. Sci. Ind. Res. (MS. No. 1358).* 8 p.

An empirical equation has been derived to account for the increase of specific compressional load with the decrease of bulk thickness in a variety of loose wools comprising the raw, water saturated, processed acid-relaxed and shrink-resisted fibre assemblies. It is somewhat analogous to the theoretical equations derived from the models of gas compressibility and bending metallic strip. The compressional characteristics as given by the coefficients of the empirical equation appear to be highly interdependent, and function of the average 'activation energy' and order of compressibility has also been discussed in the light of their correlations with natural variations of crimp form, fibre, length, softness of handle and moisture regain.

Ani. Husb. 52 Ali, M. A. 1971. **Area shrinkage due to relaxation and felting of plain-woven silk-wool fabrics.** *Pakistan J. Sci. Ind. Res. (MS. No. 1222).* 6 p.

Manual washing test of 26 silk-wool fabrics was undertaken after relaxation test. Relaxation shrinkage decreases at higher yarn tex, ply number and fabric stiffness. Also, felting shrinkage is negatively correlated with fabric stiffness and yarn tenacity. Though it is non-significant in case of 2 ply fabric, the effect of yarn geometry (tex and twist factor) on felting shrinkage of 1-ply fabrics is significant, probably, because the relative strain of playing the finer yarns may modify the expected ply-effect. When the singles are slightly untwisted, the fabric felting rates exhibit high positive correlation with those of yarn and loose wool in a wide variety of practical situations relevant to quality control.

Ani. Husb. 53 Ali, M. A. 1971. **Factors affecting the softness of silk-wool fabrics.** *Pakistan J. Sci. Ind. Res. (MS. No. 1199).* 6 p.

Subjective estimation of the tactile properties of a variety of silk-wool fabrics manufactured in factory-conditions reveals slightly better reliability of human Lipsaphis pseudobrassicae than hands in differentiating fabric softness. The correlation of softness between the fabric and loose-wool stages appears to be non-significant due to interaction between yarn twist factor and tex. Although the weave density alone accounts for 84.0% of the softness-variations in 26 fabrics, the latter may also depend on yarn evenness, tex, twist factor and ply number.

Ani. Husb. 54 Ali, M. A. 1971. **Review on textile detergency.** *Sci. Ind. 8: 132-137.*

This survey presents functional concepts of the hardness of water from various sources, surface and dirt types, mechanism of detergency with reference to soap, new detergents, builders and sequestering agents, stain removal, bleaching and fluorescent brighteners. The

effects of pH, temperature, viscosity and salt concentration of the washing liquor on fabric shrinkage have also been discussed here briefly.

Ani. Husb. 55 Samad, M. A. and A. B. M. F. Wahed. 1972. **A study of the effect of salt and other preservatives on the isolated micro-organisms from hides in the process of curing.** *M. Sc. (A. H.) Thesis. Part-I. Bangladesh Agr. Univ. (MS).*

Twelve cut pieces of an ox-hide were tried for studying the influence of sodium chloride, brine, sodium carbonate, zinc chloride and naphthalene in varying doses to study their effect on the bacterial content, nitrogen content and shrinkage rate. Difference in percentage of shrinkage was insignificant between brined and non-brined groups but there was difference of shrinkage rates between the samples. Zinc chloride (2%) for curing the hides accelerated the rate of shrinkage very much. Liquid nitrogen content in this treatment was the lowest of all the hides with nil bacterial content. Brined hides showed better grain structure and these were soft, glossy and absent of salt strain.

Ani. Husb. 56 Samad, M. A. and A. B. M. F. Wahed. 1973. **An investigation of some factors that affect the efficiency of brine and other chemicals used in curing goat skin in Bangladesh.** *M. Sc. (A. H.) Thesis. Part-II. Bangladesh Agr. Univ. (MS).*

Samples of a Black Bengal goat skin were stored at room temperatures, air conditioned room and refrigerator. Samples treated with chlorotetracycline in three storage conditions were the finest. Considering all the points zinc chloride held second position while tamarind seed flour third position and brine last position. Influence of low temperature and relative humidity in the storage room were essential factors for effective curing in which air conditioned room was the best of all.

Poultry

Genetics and Breeding

Ani. Husb. 57 Rahman, M. H. 1961. **Breeding poultry for higher egg production.** *Proc. 13th Pakistan Sci. Conf. Abs. Part. 3 Sec. A.* 66-67.

Two breeding systems have been discussed e.g. Sire-family selection and the selection of individuals within selected families. The first being more suitable for general adaptation, its main points summarized as: (1) the number of families to be tested should at least be eight. (2) Selection of eight cockerels and 120 breeding pullets to form one breeding nucleus. (3) Division of pullets by random sampling to form groups of 15, and allotment of the groups to the males. (4) Hatching of 30 pullets from each sire in one fortnightly hatch, and provision of uniform rearing conditions. (5) Saving an additional 20 pullets from each sire. If their half-sisters do well on test, these extra pullets will be required for breeding. (6) Saving eight more 15 days old cockerels from each sire, for replacements if required. The number can later be reduced, but at least five from each family should be available at breeding time. (7) Wing-banding or toe-punching of all progeny-so that the eight sire-families can be identified. (8) putting the 30 pullets from each sire in pens and measuring egg production of each family over a given period, keeping the conditions in the test pen as uniform as possible. (9). Out of eight tested families the four families with the highest egg production may be selected for final retention. (10) Surplus improved birds as the sire, cockerels and pullets from the best four families may be transferred to the main flock for commercial chick production.

Ani. Husb. 58 Hossain, M. N. and Q. M. F. Rahim. 1967. **A comparative study of the fertility and hatchability in the second generation and growth rate and weight up to twelve weeks of age of the graded Deshi x White Leghorn, Deshi x New Hampshire and Deshi x White Cornish in their third generation.** *Proc. 18th/19th Pakistan Sci. Conf. Jamshoro, Sec. A:* 52-53.

The average fertility in the grade A (Deshi x White Leghorn), grade B (Deshi x New Hampshire) and grade C (Deshi x White Cornish) in the second generation was 90, 79 and 83 per cent respectively compared with 86, 62 and 68 per cent for pure breed (1) White Leghorn (2) New Hampshire and (3) White Cornish respectively. The average hatchability of grade A, B, and C in the second generation was 93, 90 and 97 per cent respectively compared with that of the pure breed 1, 2 and 3 which was 75, 83 and 84 per cent respectively. The average body weight of the grade A, B, C at the age of 12 weeks in the third generation was 719, 982 and 1,073 grams respectively. The body weight of grade B and C at the age of 12 weeks was greater than that of the Deshi at 24 weeks. The grades had better fertility and hatchability than the respective pure bred parent (sire) and the growth rate was better than those of the Deshi birds.

Ani. Husb. 59 Huq, M. A., M. Hoque; Q. M. F. Rahim and M. A. Latif. 1968. **A comparative study of egg production, egg size, fertility and hatchability of the 3rd generation of the graded Deshi x White Leghorn, Deshi x New Hampshire and Deshi x White Cornish.** *Ani. Sci. J. Pakistan. 1(2): 105-108.*

An experiment involving 67, 3rd generation graded hens of different breeds, viz; Deshi x White Leghorn (Group A), Deshi x New Hampshire (Group B) and Deshi x White Cornish (Group C), was conducted in Agricultural University Poultry Farm for a period of one year to study the difference in performance of different breeds of graded hens. Average yearly egg production of group A, B, and C was 120, 128 and 102 respectively. Analysis of variance indicated no significant difference in egg production between grades. The average weight of the eggs of the three groups was 57.33, 55.63 and 61.30 gms. respectively. The fertility of eggs of group A, B and C was 85.5, 81.6 and 55.0 per cent respectively. Analysis of variance indicated significant difference in fertility between different groups. The average hatchability of the fertile eggs was 84.6, 86.7 and 74.5 per cent for the groups A, B and C respectively.

Ani. Husb. 60 Azim, A. and M. A. Wahid. 1969. **A comparative study on the performances of different crossbreds as broiler.** *M. Sc. (A. H.) Thesis. East Pakistan Agr. Univ. (MS).*

Three Crossbreds, White Cornish x New Hampshire, White Cornish x White Plymouth Rock and White Plymouth x New Hampshire were studied to compare their growth rate up to 12 weeks of age and economy of their production as broiler. The White Cornish x White Plymouth Rock crossbred was best of all the three groups so far the growth rate is concerned. Feed efficiency was best in the White Cornish x New Hampshire crossbred followed by White Cornish x White Plymouth Rock and White Plymouth Rock x New Hampshire. Feed cost to produce one pound of broiler was highest in White Plymouth Rock x New Hampshire and lowest in White Cornish x New Hampshire cross followed by White Cornish x White Plymouth Rock crossbred. Mortality rate among the three groups were non-significant.

Ani. Husb. 61 Islam, A. B. M. and Q. M. F. Rahim. 1969. **A comparative study on egg production egg size, fertility, hatchability, growth rate and sexual maturity of different upgraded and indigenous chickens of East Pakistan.** *M. Sc. (A. H.) Thesis. East Pakistan Agr. Univ. (MS).*

Egg production was significantly higher by grade B (Deshi x New Hampshire) and all graded birds produced 3 times higher than indigenous birds. Egg weight was highest in grade C (Deshi x White Cornish) than other two and indigenous. The hatchability in second generation was higher than in 3rd and 4th generations while average weekly gain up to 12 weeks of age was higher in grade B in third generation than others. Graded birds attained maturity earlier than respective pure breeds but indigenous pullets attained maturity earlier than graded and exotic pure breeds.

Ani. Husb. 62 Ahmed, S., M. A. Latif, and M. A. Hamid. 1971. **Comparative study of the fertility and hatchability of eggs of different breeds of laying bird under the university farm condition.** *Ani. Sci. J. Bangladesh.*

An experiment involving different breeds of laying hens was conducted in the Agricultural University Poultry Farm, Mymensingh for a period of 4 months, to study the difference in fertility and hatchability of eggs. It was observed that the fertility was highest in case of Rhode Island Red in comparison with other breeds. Hatchability of eggs varied in all groups of hatching eggs and the percentage of hatching was not satisfactory due to frequent failure of electricity during the period of electricity during the period of liberation movement.

Ani. Husb. 63 Huq, M. A., M. Hoque and Q. M. F. Rahim. 1971. **A comparative study of livability, growth rate, age and weight at sexual maturity of the fourth generation graded Deshi x White Leghorn, Deshi x New Hampshire and Deshi x White Cornish.** *Ani. Sci. J. Bangladesh. 4(1-2): 13-16.*

The livability of the chicks of groups A, B and C (representing Deshi x White Leghorn, Deshi x New Hampshire and Deshi White x Cornish respectively) on average were 87, 86 and 82 per cent respectively. The average initial weight of chicks of three groups were 38, 37 and 41 gms. respectively and during the period of sixteen weeks highest weekly gains in those groups were 88, 111, and 123 gms. respectively. Average weekly gain per bird was 44, 60 and 65 gms. with average body weight at sexual maturity of 998, 1,700, and 2,814 gms. The average age at sexual maturity was 231, 240 and 274 days for those groups of birds respectively.

Ani. Husb. 64 Ali, A. and M. Hoque. 1972. **A study of the heritability of some important broiler traits.** *M. Sc. (A. H.) Thesis. Bangladesh Agr. Univ. (MS).*

The experiment was conducted to find out the heritability of 8-week body weight and shank length of two broiler breeds New Hampshire and Rhode Island Red. Heritability estimates of body weight calculated by using paternal half sib, maternal half-sib and full-sib correlations were 0.46, 0.60 and 0.526 for New Hampshire and 0.27, 0.944 and 0.60 for Rhode Island Red. Heritability estimates for the same character were 0.246, 0.07 and 0.16 when estimates were done ignoring breeds. Heritability of shank-length obtained by using the same procedure were 0.29, 0.011 and 0.15 for New Hampshire, 0.216, 0.173 and 0.383 for Rhode Island Red and 0.55, 0.91 and 0.73 for two breeds pooled together.

Nutrition and Feeding

Ani. Husb. 65 Rahman, M. H. and M. A. Momen. 1961. **Fattening of indigenous fowls by using synthetic hormones.** *Proc. 13th Pakistan Sci. Conf. Abst. Part 3 Sec. A. : 66.*

The object of the experiment was to study the effect of synthetic hormone in fattening fowls and thereby to attain a maximum day down of extra muscle and fat at a minimum cost. Two types of synthetic hormones, e.g., Stilhexell and Hexoestrol were used. Some indigenous

fowls were implanted with one pullet each of Stilhexell and Hexoestrol along with controls. Weekly body weights were then recorded. The treated fowls of both the groups were found to gain body weight quicker than the control up to 12 weeks. Thereafter, the fowls began to lose the extra weights gained earlier. It is, therefore, suggested that hens and cocks may be fattened by use of synthetic hormones 10-12 weeks before they are due to be slaughtered.

Ani. Husb. 66 Latif, M. A., M. A. Wahid, and Q. M. F. Rahim. 1965. **Investigation to the practicability of continuous feeding of Terramycin, Hygromycin and Piperazine as feed additives in growing chicks.** *Pakistan J. Biol. Agr. Sci.* 8(1): 192-199.

The practicability of continuous feeding of Terramycin, Hygromycin, Piperazine HCl, and a combination of Piperazine HCl, and Hygromycin as feed supplements in growing chicks was studied with 75 chicks of 18 days old for 94 days. The chicks were grouped into 5 lots by randomization in a growing battery. Apparently, Terramycin improved weight gain while other treatments suppressed though statistically not significant. Effect livability was about the same in all treatment. Feed efficiency was highest in the Terramycin group while Hygromycin was the poorest. *Ascaridia* was found in the basal lot and not in the treated lots.

Ani. Husb. 67 Krueger, W. F., M. A. Wahid and J. H. Quisenberry. 1966. **The effect of sulfaquinoxaline and chlortetracycline in combination on fertility and hatchability of chicken eggs.** *Poultry Sci.* 45: 1098.

The effect of feeding a combination of sulfaquinoxaline and chlortetracycline continuously in the ration on fertility, hatchability and egg characteristics were investigated. Leghorn hens in 8 months egg production, and with no history of a disease outbreak, were divided into 5 treatment groups. Five treatment rations were formulated containing either 0.000, 0.008, 0.016, 0.024 or 0.032% Sulfaquinoxaline. Chlortetracycline levels paralleling the Sulfaquinoxaline levels were 0.000, 0.035, 0.070, 0.105 and 0.141 gms. per Kg. of feed. The treatment rations were fed for nine weeks, and all treatments were replicated. Fertility and hatchability were not affected significantly by the addition of drug combination. Fertility was 90.4, 90.7, 73.6, 82.9 and 89.6% for 0.000, 0.008, 0.016, 0.024 and 0.032% levels of the Sulfaquinoxaline complex respectively. Comparable means for per cent hatch of fertile eggs were 81.7, 88.7, 85.2, 82.2 and 88.1. Statistical analyses showed that the difference in those means were the result of pen rather than treatment effects. No visible abnormalities in the dead embryos or hatched chicks were observed. Egg production, egg size, and specific gravity of the eggs were not affected by the level of Sulfaquinoxaline and Chlortetracycline in the ration.

Ani. Husb. 68 Wahid, M. A., W. F. Krueger, C. B. Ryan, and R. L. Atkinson. 1967. **Optimum protein levels for off-season turkey hatching egg production.** *Poultry Sci.* 46: 1334.

Eight pens, each containing 1200 BBB or BWB young turkey breeder hens, were fed either 19, 21, 23 or 25% protein breeder ration from August 1 to December 17. Energy levels of the

rations decreased as protein were increased. Each treatment group consisted of 1200 BBB and 1200 BWB hens in separate pens. Forty hens were randomly chosen in each pen, marked, and weighed at bi-weekly intervals. Hens receiving 19% protein gained 15.5% of their initial housing weight but soon declined to 8.2% of initial weight. Those on 21 and 25% protein gained 12.00 and 13.7% respectively of initial housing weight and were able to maintain more of this gain. Birds on 21, 23 and 25% rations laid 3 to 6 eggs per hen more than those on 19% protein. Egg size favoured the high protein rations Fertility of the hens on 19% protein was two per cent higher than that of other groups. Hatchabilities of the hens on 19, 21, 23 and 25% protein were similar. Total poultry yield per hen housed and feed per egg favoured the birds on the 21% protein ration.

Ani. Husb. 69 Bulbul, S. M. 1968. **The use of fish meals, unidentified factor sources in Laying hen diets.** *Ani. Sci. J. Pakistan. 1(1): 74-87.*

In this experiment 280 pullets were used to compare the effects of basal diets: (1) With and without unidentified factors, (2) Without unidentified factors but supplemented with Menhaden and Peruvian fish meal on the body weight egg production, egg size, feed efficiency and mortality. Both these diets were supplemented with antibiotic fermentation solubles. The egg production and feed efficiency of those birds receiving basal diet with multiple sources of unidentified factors was significantly higher than those without unidentified factors, with significantly larger body weight and highest mortality. The basal diet with Menhaden and Peruvian fish meal without the unidentified factors supplemented with antibiotic fermentation solubles reduced body weight, egg size, and mortality without any significant effect on egg production and feed efficiency. Menhaden fish meal fed birds laid significantly more eggs but without significant difference in body weight, feed efficiency and mortality but when both fish meal diets supplemented with antibiotic fermentation solubles compared, the Peruvian one gave larger body weight and egg size without significant difference in egg production, feed efficiency or mortality. This suggests that an interaction between animal protein and unidentified factors exists and greatest return from unidentified factor supplementation may be expected when animal protein source is low.

Ani. Husb. 70 Hamid, M. A., S. M. Bulbul and M. A. Latif. 1968. **A comparative study of fish meal, meat offals, vegetable protein and terramycin (TM-5) on the growth rate of growing chicks.** *Ani. Sci. J. Pakistan. 1(2): 96-104.*

In the experiment 89 birds were used to determine the effect of feeding locally processed fish meal, meat offals and vegetable protein with terramycin (TM-5) on growth rate, feed efficiency and mortality of growing chicks in order to formulate an economic ration as substitute for fish meal or meat offals. The experiment was continued for 9 weeks. The birds in lot no. 1 were given a basal ration of dry mash containing the vegetable protein. In addition to the basal diet the treatment lots no. 2, 3 and 4 were supplied with terramycin, fish meal and meat offals respectively. The average body weight of 4 different treatments at 9 weeks of age was 436.59, 453.73, 507.67, and 528.74 gms. respectively and average feed consumption per bird of 4 groups was 1460, 1577, 1632, and 1659 gms, respectively. The average body weight

gain and feed efficiency were highest in the meat offals group with no significant difference in mortality. The cost of feed consumed per bird up to 9 weeks of age was lowest in this lot again. It is evident that the locally available meat offals was superior to other local feeds used and this may be efficiently utilized for the production of growing chicks.

Ani. Husb. 71 Rahman, A. K. M. and S. M. Bulbul. 1968. **A comparative study of the use of different levels of antibiotic (TM-5) in the feed mixture of growing chicks.** *Ani. Sci. J. Pakistan. 1(1): 44-45.*

A total of 80 randomly selected New Hampshire x Deshi 4th generation graded chickens were used to determine the effect of antibiotic at different levels on growth, feed efficiency and livability. The chicken's ancestors received continued treatment of antibiotic up to 3rd generation. Of the four treatment groups, no. 1 was the control with basal ration, and nos. 2, 3 and 4 received antibiotic at the rate of 5, 10 and 15 gms. per ton of feed respectively. The mash ration with 22% protein was used and the experiment was continued for 9 weeks. The average body weight of chickens of the four groups at 9 weeks of age was 487.6, 436.4, 444.2 and 471.1 gms. respectively, while the average feed consumption was 2166.00, 1895.45, 1876.88 and 2046.68 gms. The analysis of variance for feed efficiency data indicated not significant differences among the four groups and there was no effect of antibiotic on growth and feed efficiency and livability up to 9 weeks of age.

Ani. Husb. 72 Shahjahan, G. M., M. A. Razzaque and A. Quddoos. 1968. **Blood meal as source of animal protein for growing chicks.** *Ani. Sci. J. Pakistan. 1(2): 24-29.*

The possibility of using blood meal as substitute for animal protein in ration of growing chicks was studied with 72 one-day old chicks up to 10 weeks of age. The birds were distributed into four groups each with 18 birds and supplied a basal ration of vegetable protein (A), basal ration with blood meal (B), fish meal (C) and blood meal + fish meal (D). The ration which was supplemented with 2.5% blood meal and 2.5% fish meal, produced better and significant body weight gain than with 5% blood meal and the groups receiving combination of blood and fish meal was better than the one received only fish meal, while the feed efficiency was comparatively better in the group of 5% fish meal. It was concluded that blood meal prepared from slaughter house can be used as source of animal protein in the ration of growing chicks along with other source and that 50% of fish meal may be supplemented with blood meal.

Ani. Husb. 73 Khashru, N. A. M. 1969. **Effects of unidentified factors in the diets on the performance of laying hens.** *M. Sc. (A. H.) Thesis. East Pakistan Agr. Univ. (MS).*

An experiment involving 30 White Leghorn x Deshi 5th generation graded laying hens was conducted for a period of 6 months in the Agricultural University Poultry Farm, Mymensingh to find out the effects of unidentified factors (UF) on body weight, egg production, feed efficiency and mortality and also to find out the relative cost of ration when added to laying hen diets. It was evident that there was no effect of unidentified factors sources on the body

weight of laying hens. Though the variations in egg production of different groups were not statistically significant, yet the diet containing fish meal (10%) and the diet containing fish meal (10%) plus 6.5% skim milk powder as unidentified factors showed increased egg production high egg weight and better feed efficiency over the control group which had only 5.5% fish meal. No effect was observed on livability by the UF sources in the diet. Income over feed cost was much better in the groups fed unidentified sources in the diet than the control group.

Ani. Husb. 74 Ahmed, S., W. D. Graves and Q. M. F. Rahim. 1970. **The cost to produce ready-to-lay pullet in terms of pound of feed, labour and efficiency factors.** *Bangladesh J. Ani. Sci.* 3(1-2): 6-11.

This investigation was carried out with 26 white Cornish and 25 White Leghorn pullets cost of producing ready-to-day pullets under Bangladesh condition. White Cornish pullets started laying at 25 weeks of age, and consumed on average 27.62 pounds of feed till the end of the experiment. The average mortality rate in this group was 6% and the percentage of pullets produced was 52. White Leghorn pullets started laying at 22 weeks of age and during the period they consumed on average 18.80 pounds of feed. They reached maturity earlier than White Cornish. The average mortality was 4% and the percentage of pullet produced was 50. The total costs of producing ready-to-lay pullets of White Cornish and White Leghorn breeds were Taka 5.58 and 4.49 each respectively.

Ani. Husb. 75 Ahmed, S. and Kyiz. 1971. **The investigation of microclimate of the broiler fattening house on deep litter in different seasons of the year.** *Acta. Univ. Agric (Brno, Fac. Agron.* 19, 1971, 4: 771-78).

A comparative study was carried out to determine the intensity of changes of the microclimatological factors within the fattening house in different seasons of the year. The differences in temperature regime of the fattening house in different groups of broilers were significant. The moisture content of the fattening house was higher towards the last few weeks of the all fattening groups in consequence of the increased activity of the maturing broilers. The differences in humidity per cent of the fattening house in different groups of broilers were not significant. A high concentration of NH_3 above permissible level (0, 02 mg/l) was detected within the fattening house towards the last 2 weeks of all fattening periods excepting spring season while the content was almost within the acceptable limit. A striking rise of CO_2 concentration of the broiler house above permissible level (2, 25%) was found during the last weeks of all fattening seasons excepting autumn season while it was almost within the permissible level. The difference in NH_3 and CO_2 concentration of the fattening in different groups of broilers were not significant.

Ani. Husb. 76 Latif, M. A. 1971. **Use of shati (*Curcuma zedoaria*) and molasses to replace cereal grains in chick ration.** *Action.*

Three experimental rations containing 22% protein and 845 calories per pound of mixed feed, were fed to 3 groups of 96 Rhode Island Red chicks (one group of birds received 50% wheat

without any shati and molasses another group received 15% wheat + 25% shati + 10% molasses and remaining group received 15% wheat + 20% shati + 15% molasses) for a period of 12 weeks to study the efficiency of "Shati" and molasses as compared to wheat grain in growing chick ration on the body weight, feed consumption, feed efficiency and mortality. It was observed that the group which received 15% wheat + 20% shati + 15% molasses showed better gain in weight, less mortality, better feed efficiency and also was found to be economical in comparison with other two rations. It was also noticed that high level of shati (25%) may have some depressing effects on body weight gain but the level of 15% molasses in the ration encouraged the body weight gain than at the 10% level. It may be concluded that inclusion of more than one sources of carbohydrate proves to be better than the single source of carbohydrate in growing chick ration.

Ani. Husb. 77 Latif, M. A and M. S. Islam. 1971. **Economic feasibility of partial replacement of cereal grains by sweet potatoes (*Ipomea batatas*) and molasses in growing chick ration.** *Ani. Sci. J. Bangladesh. 4(1-2): 32-41.*

The following experimental rations were used: (1) 25% sweet potatoes + 10% molasses + 10% wheat, (2) 20% sweet potatoes + 15% molasses + 10% wheat (3) 45% cereal grains. The final average body weight of chicks at 18 weeks of age were 768.87, 705.91, and 744.08 gms; while average feed consumptions were 9.5, 10.0 and 11.1 lbs. in 1st, 2nd and 3rd treatments respectively. Better feed efficiencies were found in the groups fed rations containing sweet potatoes and molasses. The groups fed sweet potatoes and molasses were most profitable and that raising chicks by feeding rations containing sweet potatoes and molasses had satisfactory effects to replace a part of cereal grains such as maize and wheat and is economical under Bangladesh conditions. Further studies are required to determine the optimum levels of sweet potatoes and molasses in the growing chick ration.

Ani. Husb. 78 Imam, M. A. and M. A. Latif. 1972. **Amino acid supplementation to vegetable protein diet and economic use of slaughter house wastes and fish by-products in the poultry ration.** *M. Sc. (A. H.) Thesis. Bangladesh Agr. Univ. (MS).*

An experiment was conducted with 110 randomly selected seven month old Star cross pullets reared in the Agricultural University Poultry Farm, Mymensingh, to study whether the vegetable protein diets can be supplemented with amino acid, like lysine or methionine as a substitute of animal protein. There were 5 treatments and each treatment groups was housed in two replicates of 11 birds each. This experiment was conducted for 4 periods of 30 days each. The group of birds which received basal diet with vegetable protein with added lysine had the highest body weight (3.94 lbs.), and lowest body weight (3.63 lbs.) in the group which received basal diet with vegetable protein supplemented with lysine and methionine. The average per day egg production for the group of hens which received basal diet with meat offals and blood meal was highest (26.61%) than other treatment groups and was lowest (15.36%) in the group which received basal diet with vegetable protein with added lysine. Feed efficiency was highest (7.56 lbs.: 1) with meat offals and fish meal and poorest in (12.29 lbs.: 1) with vegetable protein with added lysine.

Ani. Husb. 79 Ahmed, S., M. A. Hamid and A. Rahman. 1973. **The performance of white leghorn and star cross in different seasons of the year at Mymensingh.** *Bangladesh J. Agr. Sci. (MS)*.

This investigation was carried out covering complete one year starting from July 1971 to June 1975 and this period was divided into four quarter in order to see the effects, if any, on egg production. It was observed that the egg production, feed consumption and feed conversion of both the groups were comparatively better during the month of February and March than the rest of the period of the laying season. The difference in egg production between two groups were statistically nonsignificant. Quarterly egg production of both the groups were comparatively better during 2nd and 3rd quarters (Season) than the remaining period.

Ani. Husb. 80 Rahman, A. and M. A. Latif. 1973. **Effects of feeding khesari (*Lathyrus sativus*) in growing and laying birds.** *M. Sc. (A. H.) Thesis. Bangladesh Agr. Univ. (MS)*.

Three experimental rations (commercial feed; basal + 5% khesari and basal + 10% khesari) was used to study its effects upon the performance of growing and laying birds under the Agricultural University Farm conditions, Mymensingh. It was observed that the group feed with basal 10% khesari showed highest body weight gain, highest egg production, lowest mortality and best feed efficiency (3.98) amongst the groups studied. Feed efficiency was poorest (4.32) in the group feed with basal (commercial feed) and intermediate (4.23) in the group fed with 5% khesari. Statistical analysis indicated that the treatment ration had no significant influence on the mortality of birds.

Miscellaneous

Ani. Husb. 81 Bulbul, S. M. 1968. **Determination of the Haugh unit of eggs stored into cryovac sac and sealed can.** *Ani. Sci. J. Pakistan. 1(2): 93-95.*

The eggs collected every 2 hours and put inside the cryovac sac and sealed can, maintained better Haugh Unit than the usual collection and storage method at the end of the day.

Ani. Husb. 82 Latif, M. A. 1968. **The effect of oiling and CO₂ in maintaining the quality of eggs during storage.** *Ani. Sci. J. Pakistan. 1 (2): 113-120*

The results indicated that all the treatments maintained egg quality better than the control. Eggs treated with CO₂ with or without drying agent showed the highest retention of the initial quality of the eggs in terms of Hough Units. The oil treatment of eggs however, was found the simplest and least expensive method of preserving the quality of eggs. The treatment of CO₂ without a drying agent had relatively greater number of bacterial or mold growth on the shell. The study also demonstrated that the escape of CO₂ from eggs during the storage period decreases the quality of the eggs.

Ani. Husb. 83 Rahman, M., W. D. Graves, M. Hoque and M. A. Latif. 1968. **Cost of producing broiler up to twelve weeks of age.** *Ani. Sci. J. Pakistan. 1(2): 109-112.*

An experiment involving three different crossbreeds, viz.; White Cornish x White Plymouth Rock, White Cornish x (New Hampshire x Deshi) and New Hampshire x Deshi was conducted for a period of 12 weeks in Agricultural University Poultry Farm with an object to find out the cost of producing broiler up to 12 weeks of age. Amongst the group studied, White Cornish x White Plymouth Rock gained highest final average weight of 3 pounds per bird in twelve weeks with average weekly gain of 110 grams. But the amount of feed required for each pound of gain (2.39 pounds) was lowest in New Hampshire x Deshi group. In calculating the production cost for each pound of live weight; feed, chick, labour and miscellaneous costs were considered. Average cost per pound of live weight Taka 0.70, 0.76 and 0.69 for White Cornish x White Plymouth Rock, White Cornish x (New Hampshire x Deshi) and New Hampshire x Deshi, respectively.

Ani. Husb. 84 Latif, M. A. and M. A. Bari. 1969. **C comparative study of growth rate in broiler chicks of different crosses of heavy breeds.** *Ani. Sci. J. Pakistan. 2(2): 114-127.*

This experiment was carried out in the Agricultural University Poultry Farm, Mymensingh. Twenty five chicks of White Plymouth Rock x White Cornish cross (Lot No. 1), 27 chicks of Rhode Island Red x White Plymouth Rock cross (Lot No. 11) and 54 chicks of the cross White Cornish x Rhode Island Red (Lot No. 111) were used in this experiment. Best hatchability was observed in Lot No. 11 (88.57%), poorest was in Lot No. 111 (63.33%) and Lot No. 1 was the intermediate (71.11%). The final body weight gain in different Lots of broilers at 12 weeks of age were 2.28 lbs. and 1.77 lbs. respectively. Average feed consumptions in 12 weeks were 6.50, 6.63 and 4.82 lbs. in Lot No. 1, 11 and 111 respectively. Feed efficiency was best (2.72 lbs) in Lot No. 111, Poorest (3.26 lbs) in Lot No. 11 and intermediate (2.85 lbs) in Lot No. 1. The mortality percentage of different broilers at 12 weeks of age were 0.0, 7.4 and 0.0 respectively. Cost to produce a pound of live weight broiler were Taka 0.98 and 1.08 in Lot. Nos. 1, 11 and 111 respectively. In the most profitable lot (Lot No. 1), feed, chick, labour and miscellaneous costs constituted 57.98%, 22.30%, 13.29% and 6.24% respectively of the total production costs.

Ani. Husb. 85 Wahid, M. A. 1969. **Effect of fluctuating incubation temperature on hatchability.** *Ani. Sci. J. Pakistan. 2(2): 65-69.*

It has been found that the influence of fluctuating temperature it has no adverse effect on hatchability during the first week of incubation, rather increased hatchability by 1.5% compared to normal. On the other hand the fluctuating temperature in the second week of incubation decreased hatchability by 17.29% and 15.79% as compared to the first week-fluctuation and normal temperature respectively.

Any. Husb. 86 Latif, M. A. and M. A. Salam. 1970. **A comparative study of growth rate in different pure and crossbred chicks for broiler production in Bangladesh.** *Bangladesh J. Ani. Sci.* 3(1-2): 22-32.

An experiment was conducted with 126 chicks comprising 4 lots (43 Rhode Island Red chicks Lot. No. 1, 32 New Hampshire chicks Lot No. 11; 23 White Plymouth Rock male x Rhode Island Red female Lot No. 111, 21 Rhode Island Red male x New Hampshire female chicks Lot No. IV) to compare growth rates feed efficiency, feed cost, mortality and to determine the cost of production per pound of live weight broiler in different pure and crossbred chicks. The average final body weights of broilers at 12 weeks of age were 1.56 lbs, 1.60 lbs., 2.22 lbs and 1.80 lbs in Lot No. 1, 11, 111 & IV, respectively. Feed efficiency at 22 weeks of age were 2.80: 1, 3.16:1 and 3.22: 1 for the Lot Nos. 111, 1, IV, and 11 respectively. Average body weight of chicks were statistically significant at both phases. But the difference in feed consumption were not significant. Per cent of mortality was highest at Lot No., 111 (8.69) followed by Lot No. 11 (2.56). Cost of production of broiler was calculated on the basis of feed, chick, labour and miscellaneous costs only. The costs per pound of live weight of broiler at 12 weeks of age were Taka 0.29, 1.02, 1.14 and 1.12 for Lot No. 111, 1, IV and 11 respectively. At 12 weeks broiler production was profitable in all lots.

FISHERIES

Aquiculture and Management

Aquiculture

Fish. 1 Doha, S. 1965. **The fresh-water fish and fisheries of Pakistan with special reference to fish culture for food.** *Dissertation Abstracts (25(12) Michigan State Univ.*

The nature and present condition of the fresh-water fish and fisheries of Pakistan with reference to fish culture for food have been investigated. The fresh-water fisheries constitute nearly 70% of all fisheries of Pakistan. The productivity of these waters are believed to be quite high, but the traditional methods of fish culture & fishing have not significantly increased the catch. Ponds are not constructed in Pakistan on a scientific basis. Ponds are never limed or fertilized with standard inorganic fertilizers. Artificial feeding of carps is rarely practiced in Pakistan. From the physico-chemical and biological points of view, Pakistan's fisheries in fresh-water rivers, lakes, swamps and rice fields are not well managed. Frequently, destructive, fishing practices are employed for lack of effective conservation measures. The craft and gear are also outmoded and are not effective in catching operation. Poor means of preservation, storage, transport and marketing have further hindered a greater consumption of the fresh-water food fishes in Pakistan. The socio-economic conditions of fisherman need great improvement.

Fish. 2 Huq, M. F. 1965. **The effect of crowding on the growth of fry of channel cat fish *Ictalurus punctatus* (Rafinesque).** *Sci. Res. 11(3).*

Experiments were conducted to determine the effect of crowding on the growth of fry channel catfish, *Ictalurus punctatus*. Five pairs of ponds, each with a surface area of 0.07 acre were stocked with fish at the rate of 357; 1,428; 7,142; 21,428 and 42,857 per acre. Crowding adversely affects the growth of young channel catfish, regardless of supplemental feeding; growth decreases as the number of fish increases. Fry stocked at the highest rate (42,857 per acre) showed the highest mortality. Growth at this stocking density was intermediate between that at densities of 1,428 and 7,142 per acre. The maximum rate of stocking of fry lies somewhere between 21,428 and 42,857 per acre.

Fish. 3 Huq, M. F., Tilton, J. E. and Haque, A. K. M. A. 1968. **On the use of oxygen for the transportation of carp fry and fingerling in East Pakistan.** *Pakistan J. Biol. Agr. Sci. 11: 37-42.*

The present experiment were designed to develop a more reliable method of transporting young fish which would allow one man to carry more fish with a higher survival rate. The

method used will be inexpensive enough to be effectively utilized by all people engaged in the business of transporting fish.

Fish. 4 Huq, M. F., Tilton, J. E. and Haque, A. K. M. A. 1972. **On the use of oxygen and polyethylene bag for transporting carp fry in Bangladesh.** *Indian J. Fish.* 19: 1-10.

The problem of transportation of carp fry and fingerlings was studied over a two-year period. The first year's study indicated that by oxygenation of water, holding time for the carp fry and fingerlings to 10% mortality could be stretched from below 30 minutes to over 16 hours. This experience was made use of in the following year's experiments when fry and fingerlings were first held for 16 hours in water in polyethylene bags with oxygen bubbled in till inflated. Fish so treated were then transported in the same polyethylene bags to different centres in the country. The results were encouraging in the sense that not only the mortality rate could be reduced and survival time extended but also it brought down the carrying cost considerably.

Ecology

Fish. 5 Hussain, M. M. 1970. **Marine and estuarine fishes on the northeast part of Bay of Bengal.** *Scientific Res.* 7(1): 26-55.

Very little is known about the fish fauna of Bay of Bengal fishes due to lack of scientific papers and literatures. The present paper has been prepared by the author after five years of constant field investigations in the Bay of Bengal on board Research Vessel Sagar Sandhani, Meen Sandhani and Jalwa. 475 species belonging to 133 families have been listed in this work, out of which more than 43 species are new records for this area. Some very short but useful informations for each of the species viz. habitat and ecological conditions, zones inhabited, abundance or population size, maximum and average sizes, depth at which the fish lives etc. Together with their local names used in Bangladesh (Bengali) and in Pakistan (Urdu), have been cited.

Fish. 6 Karim, M. A. and J. M. Inglis. 1970. **Benthic distribution and seasonal fluctuations in abundance of *Chaoborus* spp. (Diptera: Chaoboridae) in an artificial pond.** *Pakistan J. Sci.* 22 (1-2) : 69-78.

Two species of *Chaoborus* live in Postoak Lake, Texas, *C. flavicans* (Meigen) and *C. punctipennis* (Say). The highest population was recorded during winger and the lowest during spring. *A. flavicans* constituted only 1.07 to 6.01 per cent of the total number and 0.79 to 5.02 per cent of total weight whereas, *C. punctipennis* formed 93.9 to 98.84 per cent of the total number and 93.98 to 99.21 per cent of the total weight of the entire *Chaoborus* population of the lake bottom. The larvae of both the species have essentially the same response to the environmental variables as indicated by the similar distribution patterns at all depths throughout sampling periods. Larval densities were highest in the deepest benthic zone in all seasons of the year, although the density of *C. punctipennis* per unit area far exceeded that of *C. flavicans*. Dissolved oxygen and temperature seemed to have no effect on the depth

distribution of *Chaoborus*. The zonation of *Chaoborus* was strongly correlated with organic content of the bottom.

Fish. 7 Sarker, M. A. L. 1970. **Patterns of feeding of the bluegill sunfish, *Lepomis macrochirus* (Rafinesque), in two heated reservoirs of Texas.** *Ph. D. Dissert. Abst.* 31(5).

The feeding patterns of bluegills, *Lepomis macrochirus* (Rafinesque), were studied in Lake Nasworthy and Lake Bastrop, two heated reservoirs. There were two stations in each reservoir: one station was in the discharge canal and the other in the open water, far removed from the discharge-area. A total of 13676 specimens from the two reservoirs were examined by the points method of stomach analysis. Comparison was based on average index of fullness of the stomachs and average food points per fish, as well as on food categories. The percentage of fish with empty stomachs was very low in both reservoirs (about 4 per cent in Lake Nasworthy and two per cent in Lake Bastrop). The average index of fullness of the stomachs was somewhat higher for Bastrop than for Nasworthy bluegills. The average food points per fish differed little between the reservoirs. Average food points increased with fish size, and relatively large food organisms like vascular plants, amphipods, crayfish, nonaquatic organisms, mollusca and fish were eaten mainly by larger fish. Tenthredinid larvae and entomostracans formed the staple diet of small bluegills and there was usually a decrease in the consumption of entomostracans with increase in length of the fish. Bluegills were found to be largely diurnal feeders but there was some feeding at night. More aquatic insects and vascular plants were eaten during June and August and fewer during December and February while the reverse was true for entomostracans. Fish from the discharge canals contained more food in their stomachs than those from the open waters as indicated by both average index of fullness of the stomachs and average points per fish. Vascular plants, aquatic insects, nonaquatic organisms and fish were eaten in greater quantities in the discharge canals than in the open water while entomostracans were consumed more in the open water than in the discharge canals.

Fish. 8 Dewan, S. and S. Doha. 1973. **Investigations into the ecology of fishes of a Mymensingh Lake.** *Ph. D. Thesis. Bangladesh Agr. Univ. (MS).* 335 p.

The ecology of 20 species of fishes belonging to 10 families has been investigated in a 7.5 acre artificial and perennial lake located in the campus of the Bangladesh Agricultural University, Mymensingh. The physical environment of the fishes was studied with respect to the size of the habitat source of water supply, depth of water, transparency of water, seasonal and diel changes in the temperature of air and water, and also colour of water. The changes in dissolved oxygen, free CO₂, pH and alkalinity of the water, and to pH, phosphorus, nitrogen, calcium and potassium of bottom soil. The biological environment of the fishes was studied with respect to aquatic macroflora, phyto- and zoo-plankton, periphyton and benthos. The biology of the fishes as influenced by their abiotic environment was studied with respect to seasonal dynamics of their population size, diel and seasonal patterns of their food and feeding habits, their length and weight relationships and condition and their fecundity.

Fish. 9 Sarker, A. L. 1973. **Feeding ecology of the bluegill, *Lepomis macrochirus* (Rafinesque) in two heated reservoirs of Texas 1. seasons of year and patterns of feeding.** *Bangladesh J. Zool.* 1(1): 23-48.

The seasonal feeding patterns of 1366 bluegill sunfish *Lepomis macrochirus* (Rafinesque) taken with a 10-foot otter trawl over 24 hour periods between April, 1968 and June 1969 from two heated reservoirs of Texas were studied by points method of stomach analysis. The studies were based on average index of fullness of the stomachs, average points per fish, as well as on eight food categories. A change in volume of food in the stomachs was noted with progressive change in seasons. The amounts of food in the stomachs were usually greatest in mid-spring, declined as the summer progressed, showed an upturn toward autumn and were least in late winter. There was a peak of abundance of aquatic insects and vascular plants in the bluegill stomachs during the summer months and a falling of in consumption of this foods during the winter while the reverse was true for the category of entomostracans. In comparing the discharge canal bluegill with the open-water ones within each reservoir, the average of total points were always found higher for the discharge-canal fish than for the open-water ones in all months.

Management

Fish. 10 Doha, S. 1965. **Inland fisheries of Pakistan. 1. Present status and measures for development II. Handling, transport, marketing and consumption of inland fish in East Pakistan.** *Pakistan J. Sci.* 17(5-6).

Detail study on handling, transport, marketing and consumption of inland fish in East Pakistan has been done, and their improvement measures have been suggested.

Fish. 11 Doha, S. and A. Haque. 1966. **Studies on the biology of tilapia (*Tilapia mossambica* Peters)-1. The food and feeding habits.** *Pakistan J. Sci.* 18(5-6): 205-215.

Results of the studies on the food and feeding habits of tilapia *Tilapia mossambica* Peters) are presented. The analysis of the stomach contents of 120 fishes continued for a period of four months reveal that the fish is an omnivore with a particular liking for phytoplankters. The phytoplankton used as food by the fish belong mostly to: blue green algae, green algae and diatoms. The fish was also found to have taken mud and sand, zooplankters and macroscopic vegetatives. The food habit depends, to a large extent, on the availability of certain planktonic food organisms. The implication of this phenomenon is discussed.

Fish. 12 Hu, M. F., R. Z. Beldame, and R. B. Davis. 1966. **The effect of crowding on the growth of fingerlings of the channel catfish *Ictalurus punctatus* (Rafinesque).** *Sci. Res.* 3(1).

The effect of crowding on the growth-rate of fingerlings of channel catfish *Ictalurus punctatus* at the stocking rates of 375, 1428, 7142, 21428 and 42857 per acre was studied in a

series of 0.07 acre ponds. Regardless of supplemental feeding, the growth-rate decreases as the number of fish increases. The independent effects of crowding and of time on growth-rates of fish are showed. A scheme to predict the rate of increment in terms of percentage for a given stocking density is given as is a scheme to predict the time-requirement for a given increment in length.

Fish. 13 Ali, M. M. 1967. **A case of heavy mortality of fish in the river Kushyara, Sylhet, East Pakistan.** *Proc. 18th/19th Pakistan Sci. Conf. Jamshoro, Sec. A. 30.*

Heavy mortality of fish was caused in the area of the river which received the natural gas fertilizer factory effluents and where the pH and the NH_4^+ ion concentration were above 8.4 and 5.00 ppm respectively. Mortality was minimized if the effluents were treated with H_2SO_4 before discharge.

Fish. 14 Doha, S. 1968. **The fishing industry and fish production in Pakistan. "Transactions of the fish protein concentrate seminar" (J.W. Parsons' ed) USAID. Pakistan Dacca. (MS). 60-67.**

An attempt has been made to indicate the present stage of production of fish and fishing industries, and the problems associated with them. Fish production in Pakistan is not at all significant with respect to her vast area of fisheries resources. There is no information regarding the estimated quantities of fish and other marine resources that are available for exploitation. Not more than 15 per cent of the continental shelf is fished at present. However, the solution requires exploration and serving of the resources, improvements in fishing gear, craft and method, better fish processing and preservation, a more efficient system of transportation and marketing.

Fish. 15 Bhuiyan, N. I., S. Doha and S. H. M. Kabir. 1970. **Studies on the toxicity of certain pesticides on 'Singhi' fish, *Heteropneustes fossilis* Bloch.** *Res. Rep. Evaluation and Coordination Commi. Directorate Agr. Govt. East Pakistan.*

The work was conducted for two seasons in 1967 and to determine the relative toxicity of various pesticides of technical and commercial grades. A series of laboratory trials were made to determine the lethal dosages of 27 pesticides. The usual laboratory procedure for testing the fish toxicity were followed at water temperature of nearly 21°C . The dosage ranged from 1 to 200 ppm to test the toxicity on 'Singhi' fish of about 1 year of age. The results were statistically analyzed. Most of the organophosphorus insecticides work quite safe to use in the field crops during rainy season, such as Diazinon (up to 200 ppm), Sumithion (200 ppm), Bidrin (750 ppm), Carbicron (250 ppm), Parathion (200 ppm), Malathion (150 ppm), Dimecron (250 ppm), Azodrin (750 ppm), Nogos (375 ppm), Gardona (750 ppm). Almost all the fungicides were suitable, such as Monmeran dust (up to 500 ppm), Similton (1000 ppm), Blastin (2000 ppm), Blasticidin (1000 ppm), and Dalapon (800 ppm). Among the herbicides tested so far were toxic to 'Singhi' fish, such as Atrazine-prometryne (1000 ppm), Gasagard (1000 ppm), and 1802 of Geigy (500 ppm).

Fish. 16 Huq, M. F. and J. E. Tilton. 1970. **Note on the use of rotenone as a piscicide in ponds on the campus of the East Pakistan Agricultural University.** *Sci. Res.* 7(2-3): 111-114.

Rotenone in the forms of 5% cube powder applied at the rate of 1.5 to 2.0 ppm total material, was used to eliminate the fish populations in six ponds on the campus of the East Pakistan Agricultural University. The treatment was successful and 25 species were killed and removed from the pond. No unpleasant taste or odour was reported by staff members who ate the fish killed by rotenone. This piscicide could become an important fisheries tool in East Pakistan and more work needs to be done to determine the extent of its usefulness.

Fish. 17 Karim, M. A. and A. Hossain. 1972. **Studies on the biology of *Mastacembelus pancalus* (spiny eel, Hamilton) in artificial ponds. Part I. Natural Habitat, Distribution, food and feeding habits, and economic importance.** *Bangladesh J. Biol. Agr. Sci.* 1 (2).

The results of a 12-months study of natural habitat, distribution, and food and feeding habits of *Mastacembelus pancalus* (Hamilton) in Pond Nos. 2 and 4 of Bangladesh Agricultural University Campus, Mymensingh, are presented. The ponds have surface of 2.38 and 6.55 acres and maximum depths of 7.5 and 8.0 feet, respectively. These were practically devoid of aquatic vegetation except for a few water hyacinth in the water areas close along the banks. A total of 295 specimens (including post-larvae) of *M. pancalus* was collected from the ponds during the study period. The highest catch of fish was in May and lowest in March and April. The percentage of male and female varied from 14.1 to 60.0 and from 15.5 to 57.1 respectively. In aggregate, the ratio of male to female was 20.27: 49.73. Stomach content analysis indicated *M. pancalus* lived on variety of food materials which included larvae of Lepidoptera, Diptera, Hemiptera, and sand grains and debris. In fact, sand grains and debris constituted about 57.24 per cent of all food materials taken together.

Fish. 18 Islam, M. A., Y. Nose and F. Yasuda. 1973. **Number and distribution pattern of black spots on body surface of rainbow trout.** *Bulletin of the Japanese Society of Sci. Fish.* 39(7): 727-739.

A survey made on the number and distribution pattern of black spots in some definite areas of the body surface 1,394 Japanese rainbow trautes showed a maximum variation in the number of spots in area B (an area on the chest around the pectoral fin) which was polymodal in nature. Modes were situated at or very close to the same locations in all the hatcheries. Annual variations did not seem to occur in the number of spots in area B which showed interhatchery differences. Average number of spots was maximum in Hiruzen where the eggs were of recent introduction from the U.S. under the name of "steelhead". The number was less in Akashina, Okutama and Ozumi while intermediate in Fujinomiya and Nikko. Significant difference was observed in the average number of spots within a particular spawning season. Early spawning group appeared to exhibit higher average number of spots in area B than the mid and late spawning groups in Okutama.

Pathology and Parasitology

Fish. 19 Rahman, A. K. M. and M. Y. Ali. 1967. **The occurrence of a spinyheaded-worm *Pallisentis nandi* in *Nandus nandus* from ponds inside Chandpur Fisheries Campus.** *Pakistan J. Sci. Ind. Res.* 10(4): 276-278.

Examination of 89 specimens of *Nandus nandus* collected during November 1965 to April '66 from ponds inside Chandpur Fisheries Campus revealed the presence of the worm *Pallisentis nandi* in cysts attached to the visceral organs, mainly the liver and the wall of intestine. Incidence of the parasite was cent percent in all the months excepting the month of December 1965 when the percentage of incidence was 91.6. The average number of worms per infected host varied between 10.6 and 33.5 in different months of observation. In few cases over 80 worms were found to harbour the liver and the intestinal wall of the individual. In no instance was an individual *Nandus nandus* infected with more than one species of *Pallisentis*. Morphological features of this species were compared with those of the other species namely *Pallisentis ophicephali* found in fishes of the family ophicephalidae. Massive infestation with this worm did not, however, cause any apparent detriment to the host and in none of the 88 infected individuals there was any appreciable pathological effect.

Fish. 20 Rahman, A. K. M. 1968. **A note on *Argulus* species which caused mortality in carps in the experimental cistern of the Freshwater Research Station, Chandpur, East Pakistan.** *Pakistan J. Sci. Ind. Res.* 11(1): 115-117.

The rate of mortality of carps due to *Argulus* infection was studied in an experimental cement cistern of the Fisheries Research Station at Chandpur. All the 17 carps (*L. rohita* and *C. catla*) died within 7 days after the mortality started. A second lot of 8 *Catla catla* measuring 9-10 inches in length were subjected to *Argulus* infestation in the same cistern and mortality in this case started after 3 days and all the fish died within 6 days after the mortality started. 429 to 826 parasites were encountered in an infected individual. In a laboratory test in glass aquarium *Argulus* killed one *Tilapia mossambica* in 12 hours and one *Notopterus notopterus* in 16 hours. Further tests were performed in glass aquaria for the control of the parasite using common salt and potassium permanganate. Permanganate (1 gm/50 gallon) killed *Argulus* in 3 days. Application of DDT powder (1 gm/100 litre) and Lime (10 gm/100 litre) killed both *Argulus* and infected fishes in 24 hours in separate tests performed in cement cisterns.

Fish. 21 Rahman, A. K. A. and M. Y. Ali. 1968. **The incidence of a nematode, *Procamallanus heteropneustes* in the stomach of *Heteropneustes fossilis*.** *Pakistan J. Sci. Ind. Res.* 11(1): 112-113.

Of the 58 specimens of *Heteropneustes fossilis* collected from water areas of Chandpur Sub-division between July and December 1965 only 46 were found infected with *Procamallanus heteropneustes* in the stomach. The percentage of incidence maintained a high figure of 85 to

100 during July to October and a low figure of 20 to 40 during November and December. The average number of worms per infected fish varied in different months between 10.3 and 13.9 during July to October and 1.0 and 1.7 during November and December. In heavily infected individuals the intensity of infection varied between 30 and 40 but no case of appreciable pathological effect was noticed and infected individuals looked healthy.

Fish. 22 Rahman, A. K. A. 1971. **On the occurrence of a larval cestoda (*Gymnorhynchus* species) in the coelom of *Pama pama* (Hamilton, 1822) from the rivers Padma and Meghna.** *Pakistan J. Sci. Ind. Res.* 14(3): 270-270.

Examination of 154 specimens of *Pama pama* collected from the rivers Padma and Meghna during July, 1966 to June, 1967 revealed the presence of a larval cestoda (*Gymnorhynchus* species) in the viscera. The larvae were mostly encysted and in few instances they were found free in the viscera. The morphological features of the cysts and un-encysted larva were described. The percentage of incidence of the larva varied between 37.50 and 100.00 in different months during the period but could not be correlated with the season. The month-wise infection intensity varied between 1.33 and 3.70 during the period. The infection intensity, however, was slightly higher (3.3-3.7 worms per infected host) between June and November than that (1.3-2.6 worms per infected host) between December and May. The overall average incidence of the larva was 63.5% during the period of observation. Infestation by the parasite was never heavy and infected individuals looked healthy.

Fish. 23 Bashirullah, A. K. M. 1973. **A brief survey of the helminth fauna of certain marine and freshwater fishes of Bangladesh.** *Bangladesh J. Zool.* 1(1): 63.

Trematode, nematode, and acanthocephalan parasites of some marine and freshwater fishes of Bangladesh are listed. In total 92 taxa of parasites are listed from 49 taxa of fishes. No parasite was found in two marine and two freshwater fishes.

Population Dynamics

Fish. 24 Doha, S. 1964. **Biology of the rockbass (*Ambloplites rupestris* Rafinesque) I. Sampling, measurements and food study.** *Agr. Pakistan.* 16(1).

Results of the study on the total length and standard length relationship of 129 and food habit of 60 rockbass are presented. The value of 'B' was 0.80 on the average which meant that the standard length was 8/10 lbs. of the total length. The food habits were found to differ with size. The small sized ones took insects more than crayfish, while the medium-sized ones took insects and crayfish equally, but the large ones took crayfish more than insects.

Fish. 25 Doha, S. 1964. **Biology of the rockbass (*Ambloplites rupestris* Rafinesque) II. Length-weight relationship and condition.** *Agr. Pakistan.* 16(1).

The result of the studies of standard length-weight relationship of 33 rockbass is presented here. The standard length weight relationship was established as $Y = 461 + 3.029 X$. The condition factors for standard length-weight were also determined.

Fish. 26 Dewan, S. and S. Doha. 1967. **Studies on the biology of tilapia (*Tilapia mossambica* Peters). II. Total length and standard length relationship.** *Pakistan J. Sci.* 19: 1-7.

Results of the study on the total length and standard length relationship in a sample of 105 tilapias (*Tilapia mossambica* Peters) are presented. A regression equation, $Y = -1.168 + 0.79X$, with $r = -0.968$ S_y 12.88mm. has been established for the standard length, denoted by Y. Once the value of X the total length, is known the value of Y, the standard length, can be calculated from the equation showing the relationship. It appears from the study that the standard length of the fish is approximately 8/10ths its total length. A conversion table for total and standard lengths and vice versa is given both in millimeter and inch for direct comparisons in subsequent studies on the problem.

Fish. 27 Doha, S. and S. Dewan. 1967. **Studies on the biology of tilapia (*Tilapia mossambica* Peters) III. Length-weight relationship and condition factor.** *Pakistan. Sci.* 19(1&2).

Results of the studies on the total length-weight relationships and the condition factor in 104 tilapias (*Tilapia mossambica* Peters) relationship was established as $\text{Log}_{10}W = -5.351 \text{ Log}_{10} \text{TL}$ with the standard error being 1.145g. The standard length-weight relationship was expressed by $\text{Log}_{10}W = -5.152 + 3.346 \text{ Log}_{10} \text{SL}$, with the standard error being 1.145 g. Values of the condition factor in the total length-weight and the standard length-weight relationships have also been determined. The mean values of k , the observed, and k_n , the relative condition factors, have been found to be 1.767 and 1.083 respectively in the total length-weight and 3.247 and 0.945 respectively in the standard length-weight relationships.

Fish. 28 Bhuiyan, N. I. and G. B. Talbot. 1968. **Fluvial migration, spawning, and fecundity of Indus river hilsa, *Hilsa ilisa*.** *Trans. Amer. Fish. Soc.* 97 (4): 350-355.

Hilsa is a widely distributed anadromous fish occurring from the Persian Gulf to South Vietnam. The Indus is the only river in West Pakistan which supports a run of hilsa. These fish enter the Indus River each year, beginning about the middle of January, and in some years remain in the river as late as November. The bulk of hilsa, however, are found during June, July and early August. Although increased stream flow does not appear to be the stimulus that attracts hilsa into the Indus, as reported for other occur during peak flows. Maturing hilsa entering the river range between 25 and 50 cm. in length while a few immature fish enter that are as small as 22 cm. Most of the male fish appear to be in their 4th year of life, while the females are represented predominantly by two age classes that appear to be their 4th and 5th respectively. Fecundity of hilsa varies between 755,000 and 2,917,000 eggs per female. There is no close correlation between length or weight and fecundity.

Fish. 29 Doha, S. and A. H. M. A. Hoque. 1968. **Biometric studies on certain populations of hilsa (*Hilsa ilisa* Hamilton) of the Padma.** *Proc. 20th Pakistan Sci. Conf. Sec. A.* 165-165.

Results of regression equation of the relationships between FL-TL, SL-TL, HL-TL, BW-TL, CPW-TL, SnL-HL, IOW-HL and ED-HL for both jatka and hilsa are presented. The high

correlation coefficient values show strong FL-TL etc., relationship in both jatka and hilsa. The analysis of covariance of the regression of the relationship showed no significant difference at 1% level in any except for IOW-HL and ED-HL relationships where significant difference at 1% level was obtained which was due to comparatively large IOW and ED in Jatka. The results of T test showed no difference between any character at 1% level thereby indicating again that the Jatka and the hilsa belong to the same race in the said river. The results of coefficients of variation (CV) for hilsa in respect of FL-TL, SL-TL, HL-TL, BW-TL, CPW-TL relationships were 1 to 3 times higher than those for Jatka, while, those for jatka in respect of SnL-HL, IOW-HL relationships were found to be 2 to 3 times higher than those for hilsa.

Fish. 30 Doha, S. 1968. **Carapace length total length relationships for male and female fresh-water shrimp (*Palaemon birmanicus* Schenke).** *Proc. 20th Pakistan Sci. Conf. Sec. C.* 29-30.

The results of the studies on the carapace length total length relationships for male and female freshwater shrimp, (*Palaemon birmanicus*) are presented. The carapace length (Y)-total length (X) relationship in the male shrimp was estimated as $Y = +2.805 - 0.4121X$ ($S_x = 15.163$ mm.) and the correlation coefficient (r) was + 0.9967; and that for the female shrimp as $Y = 1.602 + 0.439X$ ($S_x = 10.868$). The high correlation coefficient values reflect the strong CL-TL relationship for both sexes. No significant difference exist between the regression coefficients of male and female regression lines.

Fish. 31 Doha, S. 1970. **Length-weight relationship and condition in the male and female shrimp, *Palaemon malcolmsonii* (Palaemonidae, Decapoda, Crustacea).** *Pakistan J. Zool.* 2 (2): 185-193.

Results of the studies on the (1) carapace length-total length, (2) carapace length-weight and (condition of the freshwater shrimp, (*Palaemon malcolmsonii*), are presented. The carapace length (Y)-total length (X) relationship in the male shrimp was estimated as $Y = + 2.805 + 0.4121 X$ with $r = +0.9967$ and $S_x = 15.163$ mm and that in the female shrimp as $Y = -1.602 + 0.4397X$ with $r = +0.9868$ and $S_x = 10.402$ mm. the carapace length-weight relationship for the male and female shrimps were estimated as : $\text{Log}_{10}W = -4.1139 + 3.1105 \text{ Log}_{10}CL$ (standard error of the estimate being 2.121 g) and $\text{Log}_{10}W = -2.9202 + 2.3866 \text{ Log}_{10}CL$ (standard error of the estimate being 5.711 g), respectively. The average condition factors for the male and female shrimps were estimated as: 12.5683 and 11.3814, respectively, and the average relative condition factors for the same as 1.0048 and 0.9927, respectively.

Fish. 32 Hye, M. A. and S. Doha. 1970. **Fecundity of *Hilsa ilisha* of the Padma.** *Pakistan. J. Sci.* 22(3-4): 176.

Results of the studies on the fecuncity of hilsa of the River Padma were studied. The fish were collected during May to August, 1967. The fecundity of the fish was found to be very high ranging from 348,318 (fork length of fish 273 mm.) to 1,465,969 (fork length of fish 420 mm.) in number. A regression equation, $Y = 1000 (-1979.282454 + 7.065865X)$, with $r =$

+0.916 and $S_x = 39.272$ mm. was established for the fecundity by Y. Once the value of X, (F.L.) is known the fecundity (Y), can be calculated from the equation. It appeared from the study that the fork length and the fecundity bear a linear relationship. The relationship between weight and fecundity was also been found to be linear, the equation being ($Y = 100 (-54.67827 + 0.993648X)$) with $r = +0.947$ and $S_x = 91.235$ gms. where X, and Y denote weight and fecundity respectively. Here also once the value of X, is known, the value of Y, can be calculated from the equation. 'T' tests conducted on the mean diameter of ova revealed that the ova develop equally in all parts of the ovaries irrespective of their location which further suggested that the ova might be released simultaneously from both the ovaries. The relationship between ovary index and ovum diameter was not found satisfactory.

Fish. 33 Bashirullah, A. K. M. and M. A. Kader. 1972. **Studies on the maturity of marine fishes of Bay of Bengal. II. On the maturity of *Lepturacanthus (Trichiurus) savala* (Cuv. and Val.) James, 1967, with reference to variation in gonad weight.** *Bangladesh J. Biol. Agr. Sci.* 1(1): 29-34.

The body weight of *Lepturacanthus savala* varied between 20-78 gms. and 11-60 gms. in the female and male respectively. The gonad weight ranges from 0.033-3.66 gms. in the female and 0.001-0.49 gms. in the male; the maturity index between 0.6923 and 0.1511 in the female and 0.0441 and 0.7447 in the male. The male fish is maturing when the index value is 0.5 or more and immature when the value is less than 0.1. The female fish is immature when the index is less than 1.2. The ribbon fish, *L. savala*, in the Bay of Bengal seems to mature twice a year, one in February and the other during late June and July.

Fish. 34 Karim, M. A. and A. Hossain. 1972. **Studies on the biology of *Mastacembelus pancalus* (Spiny eel, Hamilton) in artificial ponds. Part II. Sexual maturity and fecundity.** *Bangladesh J. Biol. Agr. Sci.* 1(2).

Studies on sexual maturity and fecundity of *M. pancalus* are presented. The sexes were found to be distributed in equal proportions. Fish above 90 mm in total length have well differentiated gonads. Individual fish seem to spawn only once in a year and spawning period extends from May to late November with the peak in June. The fecundity was found to vary from 1,296 to 3,246 ova in a fish with mean of 2,013. The correlation between total length and fecundity and that between weight of ovary and fecundity were found to be positively related. The correlation coefficient of total length and fecundity was +0.69 and that for weight of ovary and fecundity was +0.93.

Fish. 35 Islam, M. A., Y. Nose, and F. Yasuda. 1973. **Egg characteristics and spawning season of rainbow trout.** *Bulletin of the Japanese Society of Scientific Fisheries.* 39(7): 741-751.

A linear relationship was observed between body weight and total weight of eggs, number of eggs and egg diameter. Egg diameter was found almost independent of body weight in age group 4. Smaller specimens (both in size) showed higher values of regression coefficient in

all the characters. Annual variation did not seem to occur in the majority of the surveyed hatcheries. Variation in different age groups of a particular hatchery was observed. Interhatchery variation was observed in all the characters. Akashina and Okutama exhibited higher values of total weight of eggs, gonad index and number of eggs while Hiruzen exhibited higher values of egg diameter. Total weight of eggs was large in Fujinomiya but gonad index became less due to the extraordinary size of the specimens. Total weight and number of eggs were found to vary in the early, mid and late spawning groups in Okutama. The late spawning groups exhibited higher values for the mid and the early spawning groups. An attempt was made to find out some interrelationships among the different characters.

Fisheries Biology

Fish. 36 Doha, S. 1964. **Biology of the rockbass (*Ambloplites rupestris* Rafinesque) III. Age, growth and spawning habit.** *Agr. Pakistan. 14(1).*

The age and the growth of the rockbass with respect to the total length reached at the end of each year of life have been determined and it's absolute, increment and relative growth curves are drawn. The spawning habit of the fish has also been studied. The fish spawns in May and June. It prefers 65 to 70°F temperature of water for spawning. The female fish makes a rest in the gravel-bottomed river. The male fish in sexual condition fights another male in the vicinity of its territory. Parent bass schools his young for some time after they leave their beds against predation. The number of eggs per female fish ranges from 2,000 to 4,000.

Fish. 37 Doha, S. 1965. **Breeding habits and requirements of some north American and Pakistan food fishes with special reference to the possibilities of artificial propagation of Pakistan major carps.** *Agr. Pakistan. 16(3).*

The breeding habits of some North American and Pakistani food fishes have been discussed in detail and the possibilities of artificial propagation of Pakistani major carps are suggested here. The Major carps e. g. catla (*Catla catla*), rohi (*Labeo rohita*), mrigal (*Cirrhina mrigala*), Kalbas (*Labeo calbasu*) and others of Pakistan do not breed in confined waters. The Monsoon flood is probably the principal factor in spawning of these carps. The Michigan and the adjacent states of United States and provinces of Canada fishes need some favourable physical, chemical and biological factor to spawn in the lakes. Pakistani carps attain sexual maturity in confined waters but do not spawn for want of essential stimuli. This stimuli can be initiated by pituitary injection which cause the fish to spawn in the confined water. To meet the great demand of quality fish major carps need to be induced by pituitary injection.

Fish. 38 Haq, M. F. 1973. **Note on a collection of freshwater fishes of Bangladesh.** *Bangladesh J. Sci. Ind. Res. 8(1-4): 80.*

A collection of fishes from the freshwaters of Sylhet and Mymensingh districts of Bangladesh was made by the author and a colleague of him. These fishes were catalogued at the Wildlife Science Museum of Texas A & M University, Station, Texas. A description of 47 species belonging to 16 families is given. Mention has been made as to the range of distribution of these organisms.

Fish. 39 Doha, S. 1964. **Fish and shellfish preservation by sun and or air drying in some selected countries and the problems involved.** *Agr. Pakistan.* 15(4).

An attempt has been made to indicate the simple but little known fish preservation methods by drying in the sun and air, especially in the less developed countries of Asia and Africa, where people suffer from lack of animal protein in their diet and where fish is often the main source of animal protein. Increasing the production of fish both marine and freshwater, seems to offer the best possibilities for raising the animal protein level of natural diet in these countries. Since the economic level of the people there, is low, freezing and canning are much too expensive, fresh and dried fish are the practical means to supply protein to them. While the curing methods are the practical means to supply protein to them and are found to lower the nutritive value of the products.

Fish. 40 Doha, 1965. **Freshwater fisheries of Pakistan: present status and measures for development-I. Production, craft and gear.** *Pakistan J. Sci.* 17(2-3).

The present status of production and the fishing techniques the craft and gear used in the inland freshwater fisheries of Pakistan have been examined in depth and practical measures suggested to improve them.

Fish. 41 De, H. N. and A. R. Mia. 1966. **Biochemical and nutritional studies on East Pakistan fish. Part VIII. Total volatile base, ammonia, urea, volatile reducing substances and total volatile acids in some fish of this region, and the effect of decomposition and cooking on the above values.** *Sci. Res.* 13(2): 110-119.

Nitrogen partition in the total volatile acids in the muscles of some freshwater (teleosts) of this region have been determined. The total NPN total volatile base-N and volatile reducing substances are within the ranges noted for some marine teleosts by some workers. The values for ammonia-N are below the range for marine teleosts. Spoilage caused by storage in the room temperature of 80-84⁰C for 24 hours led to high increase in the above constituents. Cooking of the fresh fish caused some escape of the above volatile compounds. Cooked fish, on spoilage, showed less increase of the contents as compared to those obtained by spoilage of the fresh fish. The probability of removal of the undesirable odour constituents of the fish by cooking as applied in the preparation of our daily meal from fish and as adopted as an integral part of the processes involved in the manufacture of Fish Flour or Fish Protein Concentrate (FPC), has been discussed in the perspectives of the above findings of the above findings.

Fish. 42 De, H. N. and H. Nazrul. 1966. **Biochemical and nutritional studies on East Pakistan fish. Part XIV. Spoilage mechanism as assessed by the trimethylamine content of some freshwater fish and the influence of cooking and freeze-storage on the above constituent.** *Sci. Res.* 3(2): 120-126.

Trimethylamine along with other volatile amines are present in the raw freshwater fish of this region and the amount of TMA-N varies from 1.5 to 5.2 mg. per 100 gm. fish tissue. Spoilage effected by storage in the room at 80-84⁰F for 24 hours caused increase of the value up to 12

mg. per cent. Cooking of the fresh fish caused escape of the above constituent. Storage for 7 days at a temperature of 41°F (5°C) also caused increase of the TMA-N unassisted by any increase of total volatile base-N. This indicates that in freshwater fish probably TMA-N arises from ammonia by transmethylation process with the help of choline as the methyl donor, which is present in large quantities in the freshwater fish of this region. This possibility has been substantiated by *in vitro* incubation of the fresh and frozen muscle tissue with choline chloride and the results are awaiting publication.

Fish. 43 Doha, S. 1966. **Fish preservation, a review with special reference to Pakistan.** *The Sci. 8(1-2).*

The characteristic changes that occur in the physical appearance and the processes involved during spoilage of fish are discussed. The traditional methods and the problems of its preservation in Pakistan are illustrated.

Fish. 44 De, H. N. and A. R. Mea. 1967. **Biochemical and nutritional studies of East Pakistan fish. XV. Investigations into the biosynthesis of trimethylamine from choline chloride by fresh and frozen stored fish muscle tissues.** *Proc. 18th/19th Pakistan Sci. Conf. Jamshoro, Sec. Chemistry. 61-62.*

The unusually high (1.5-5.2 mg%) amount of trimethylamine nitrogen present in the organs of seven freshwater fishes of East Pakistan was due to high content of choline in their tissues. This by transmethylation process caused the biosynthesis of trimethylamine and probably also di- and monomethylamines and thus detoxicated the accumulated ammonia. The enzymes involved in the process are not inactivated even if the fish is stored for long period in freezing temperature.

Fish. 45 De, H. N. and A. Islam. 1967. **Fish flour-its biochemical and nutritional studies. V. Supplementary value of fish flour protein on the nutritive value of Bengal gram (Beshan) Macaroni feed in mustard oil as evaluated by *Per* and *Cer* values and the liver fat and protein-N contents.** *Proc. 18th/19th Pakistan Sci. Conf. Jamshoro, Sec. Chemistry 60-61.*

Fish flour fortified Bengal gram when fed to the rats caused considerable gain in their body weights and increased their PER and CER values. This feed, however, decreased the liver fat deposition and the liver fat/protein-N ratios. Fish flour even when incorporated at 3% level fairly improved the nutritive value of the Bengal gram protein and minimized the damage of its protein due to heat deterioration.

Forestry

Forest. 1 Fakir, G. A. 1970. **Introduction of conifers in East Pakistan.** *Proc. 21st/22nd Pakistan sci. Conf. Abs. Sec. Agr.* 205.

Role of tree introduction in general and introduction of conifers in particular were stressed. A description and discussion of the physiography and forestry situation of East Pakistan, showing the importance of exotic conifers for the progress and industrialization of East Pakistan were dealt with. Factors responsible for successful introduction of conifers with specific examples were considered and sixteen systematic steps for making the programme of introduction of conifers in East Pakistan a success were outlined. Finally, the following twenty species of conifers with the geographic locations of collection indicated in the parenthesis against the respective species, were recommended for East Pakistan. *Pinus caribaea* (Bahamas, Cuba, Honduras, Isle of Pines & Nicaragua); *P. densa* (Florida); *P. elliotii* (Southeastern U.S.A.), *P. khasya* (Barma, Cambodia, Laos, Philippines, Thailand & Vietnam); *P. occidentalis* (Cuba, Haiti & Sandomingo); *P. oocarpa* (Central America); *P. patula* (Mexico); *P. taeda* (Florida); *P. tropicalis* (Cuba & Isle of Pines); *P. radiata* (Australia, California, New Zealand & South Africa); *Araucaria angustifolia* (Argentina & Brazil); *A. columnaris* (New Caledonia & Isle of Pines); *A. cunninghamii* (New Guinea, New South Wales & Queensland); *A. excelsa* (Norfolk Island); *Cunninghamia lanceolata* (China); *Agathis alba* (Indonesia, Malaya, Philippines, & Thailand); *A. microstachya* (Northern Queensland); *A. robusta* (Southern Queensland) and *Podocarpus amarus* (Indonesia, Java and Philippines).

Forest. 2 Fakir, G.A., R. E. Welty, and E. B. Cowling. 1971. **Prevalence and pathogenicity of fungi associated with achenes of sycamore in the field and in storage.** *Phytopathology*. 61(6): 660-668.

The most prevalent fungi associated with sycamore achenes were species of *Alternaria*, *Aureobasidium*, *Cladosporium*, *Epicoccum*, *Fusarium*, *Pestalotia*, *Peyronellaea*, *Phoma*, *Phomopsis*, and *Xylaria*. They varied in prevalence with the location, physiographic region, and year of collection. Achenes stored at 2⁰C showed no loss in germinability even after 7 month. At 20 and 30⁰C, however, germinability decreased with increasing temperature, relative humidity, and time in storage. Most fungi isolated from achenes at the time of harvest decreased in prevalence with increasing temperature, relative humidity, and time in storage. At the same time, *Aspergillus ruber*, *A. repens* and *Nodulisporium hinnuleum* fungi that had not been isolated from the achenes prior to storage, increased in prevalence with time in storage. Surface-disinfected achenes containing 15% moisture (wet-weight basis) were inoculated with spores and mycelia of five fungi and stored at 30⁰C and 84-86% relative humidity. Those inoculated with *A. ruber* and *A. repens* decreased in germinability more than non inoculated controls after storage for 35 days.

Forest. 3 Howlader, N. I. 1971. **Coastal afforestation in Noakhali district.** *Pakistan J. Forestry.* 21(2).

In recent years the coastal districts of East Pakistan, especially Noakhali, Barisal, Chittagong, have been devastated with increasing frequency by floods, tidal bores and cyclones. To reduce losses from these calamities, an embankment has been constructed around the coastal area and the off-shore islands of East Pakistan. Since the Sunderban forests lying due south of Khulna and part of Backerganj Districts considerably reduced losses from such calamities, it was argued that the presence of protective belts of tree to the seaward of the embankment might augment their protective influence. Consequently, the Noakhali Coastal Afforestation Division was created on December, 20 1966 to undertake this work in the Noakhali District.

Forest. 4 Khan, I. R. M. Z. H. 1971. ***Eucalyptus citriodora*-A promising exotic for Bangladesh.** *Bangladesh J. Forestry.* 21(2): 113-209.

Because of their adaptability to new environment, resistance to pest and diseases and rapid rate of growth, the introduction of eucalyptus have held a special position in forest tree introduction. Though unlike the western wing of Pakistan, no systematic trials have so far been undertaken in this region. Trees as old as 60 years occur in parks, gardens and school and college compounds all over East Pakistan *Eucalyptus citriodora* is the species most frequently encountered in Dacca, Sylhet, Chittagong, Cox's Bazar and Mymensingh. The oldest introduction of this species dates back to 1910. In addition of *E. citriodora*, other species are also found in various parts of East Pakistan. They were all planted around 1963.

Forest. 5 Fakir, G. A. 1973. **Linear growth rate and morphology of four isolates of *Fusarium lateritium* f. *pini* Hepting.** *Bangladesh J. Bot.* 2(2): 67-72.

Four isolates of *Fusarium lateritium* f. *pini* from loblolly, long leaf, short leaf and virginia pine were compared for linear growth rate, appearance of the fungus on artificial culture with the above species of pine was not found to be identical. Considerable variation both in morphology and physiology existed among the isolates. Neglecting minor variations, the four isolates may be classified into three distinct groups: (1) short leaf and loblolly isolates; (2) long leaf isolate; and (3) virginia isolate.

Veterinary Science

Anatomy And Histology

Vet. Sci. 1 Talukder, A. H. and M. L. Calhoun. 1967. **A modified dermal part in the skin of the croup region of horse.** *Pakistan J. Vet. Sci.* 1(3): 84-91.

The dermis of the croup and its adjacent region had a modified structure in horse. The dermis reached its maximum thickness in the croup region (5.5 mm) and gradually diminished towards the back and laterally over the gluteal region. The demarcation between the reticular papillary layers was very distinct. The organisation of the collagen fibres in the reticular layer was in 3 distinct pattern. The elastic fibres formed a rich network in the papillary layer. Arrector pile muscles were well developed and normally branched at the ends. Thick elastic fibre bundles attached the muscles with the upper dermis and the hair follicles.

Vet. Sci. 2 Khan, Ibn. R., M. A. Majeed, and S. S. Hossain. 1968. **A cheap method for the preparation of some natural models.** *Pakistan J. Vet. Sci.* 2(1): 12-15.

A cheap method for the preparation of dry natural models of some hollow internal organs is described. The technique comprises of fixation and dehydration of the evacuated organs in industrial methylated spirit distension and positioning by inflation, drying in tropical sun and polishing the exterior with transparent DDT added varnish. A few models thus prepared have shown great promise.

Vet. Sci. 3 Khan, M. A. B. and A. H. Talukdar. 1969. **The distribution and organization of the fibrous components of the dermis of Black Bengal goat.** *Pakistan J. Vet. Sci.* 3(4): 170-177.

Twenty body areas of the skin from eight Black Bengal goats including four castrated males and four females of 1 to 3 years of age were used in this study. The dermis was divided indistinctly into a superficial papillary layer and a deep reticular layer. The papillary and reticular layer measured 0.639 mm. and 1.259 mm. respectively. The collagenous fibres was fine and loosely arranged in the papillary layer and were coarse, dense and large in the reticular layer. The elastic fibers in the papillary layer were fine and numerous around the hair follicles, blood vessels and on either end of the arrector pile muscles. These fibers were coarse and less numerous in the stratum reticular and were mostly present in the deeper part of this layer. At the dermo-epidermal junction fine elastic fibres formed extensive network. Fine reticular fibres were uniformly distributed throughout the dermis and were more numerous around the hair follicles, blood vessels, nerves, sweat and sebaceous glands.

Vet. Sci. 4 Mia, M. A. 1968. **The posterior mesenteric circulation in the goat.** *Pakistan J. Vet. Sci.* 3(3): 127.

A detailed gross anatomical dissection were made on five females, three of which were injected with red and blue latex. As revealed in the preliminary study, major branches of the posterior mesenteric artery in goat closely resembles of the ox and sheep. The origin, incidence, distributions and variability of the posterior mesenteric artery was demonstrated with illustrations.

Vet. Sci. 5 Mia, M. A. 1969. **The arterial blood supply of adrenal gland in goat.** *Pakistan J. Vet. Sci.* 3(2): 75.

Seventeen anatomical dissections of the adrenal gland blood supply were made of twelve castrated male and five female, three of which were injected with latex solution. The adrenal artery, originating from the abdominal aorta, with lesser contributions from the anterior mesenteric artery. An occasional supply from the coeliac and renal artery was also encountered. The right adrenal empties to the posterior vena cava while the left adrenal gland drains into the renal vein. Variability's of the arteries nourishing the adrenal glands are discussed.

Vet. Sci. 6 Talukdar, A. H. 1970. **A description of the paraventricular and supraoptic nuclei of the bovine hypothalamus.** *Pakistan J. Zool.* 2(2): 159-162.

The supraoptic and paraventricular nuclei of two transverse and one sagittal series through the hypothalamus of adult bovines were stained with Cresyl Echt Violet for Nissi substance, Dawson's modification of Halmi's stain for neurosecretion and Kluver's luxol blue stain for nerve fibres. The paraventricular nucleus was located posterior to the anterior commissure, dorsal to the optic chiasma medial to the anterior column of fornix and ventral to the mammillothalamic tract. The area measured 4.14 mm. anteroposteriorly, 6.82 mm. dorsoventrally and 0.88 mm. mediolaterally. The supraoptic nucleus was extending 3 mm. along the ventral surface of the preoptic region and 3 mm. along the surface of the tubercinereum and laterally from the third ventricle for a paraventricular cell mass, composed of packed large cells, was found in between the fornix and the supraoptic nucleus. The cells and the nuclei were larger in paraventricular than the supraoptic cells. Neurosecretory substance seldom filled the cytoplasm of the cells but did not occur in the processes of the cells.

Vet. Sci. 7 Talukdar, A. H. 1970. **Sweat glands of the horse: A histologic study.** *American J. Vet. Res.* 31(12): 2179-2190.

Thirty-five areas from the skin of 6 adult horses were examined for distribution, numbers and histologic characteristics of the sweat glands. Sweat glands were numerous and well developed in most areas examined. They were less developed on the middle of the back and on the limbs and were absent in the upper lip, in the lower lip within 1.0 cm. of the

mucocutaneous junction, and around junction the margins of the hoof and ergot (about 5.5 mm.). The glands were large in the midsubmandibular area, the skin of the circumanal area, external ear canal, nostrils, prepuce, lower lip, and in the skin of the vulva. The frog of the hoof contained spherical masses of tubular glands. The gland tubules with the secretory cells and associated myoepithelial cells were apocrine in type. A stratified border and basal intercellular canaliculi were present. Glycogen could not be demonstrated. The ducts opened into the hair follicle at various levels and a few opened into a depression beside the hair follicle or directly into the surface.

Vet. Sci. 8 Talukdar, A. H. 1970. **Sensory end organs in the upper *Lipaphis pseudobrassicae* of the horse.** *American J. Vet. Res.* 31(10): 1751-1754.

Sensory nerve endings in the skin of the upper lip of the horse were demonstrated by Davenport's modification of the Bielschowski-Gros method. Three different types of nerve endings were observed: (1) encapsulated lamellated endings, (2) encapsulated nonlamellated endings, and (3) free nerve endings. Most of the organized endings originated from a nerve plexus in the superficial dermis. The free nerve endings of the epidermis and subepidermal region stemmed from the networks extending into the dermal papillae. The upper lip of the horse is used as a tactile organ in the comprehension of food. The sensory end organs which respond to the tactile stimuli were studied as of a more extensive investigation on the histology of the integument of the horse. We wanted to determine if the structures of the sensory end organs found here were similar to those reported previously in such sensitive area as the vagina, periosteal, and joints.

Vet. Sci. 9 Anam, K. M. 1971. **A preliminary study of the innervation of heart in goat.** *M. Sc. (Vet. Sci.) Thesis. East Pakistan Agr. Univ. (MS).*

Five Black Bengal goats were killed and fixed in suitable media. Well-fixed animals were dissected to trace the origin, course and distribution of nerves innervating the heart. The cervical and thoracic portions were dissected. No cervical cardiac nerves cranial to cervicothoracic ganglion was observed in this study. Independent sympathetic nerves emerged from thoracic and cervicothoracic ganglion on either side. The thoracic cardiac nerves of the right side were less prominent than the left side. The cervicothoracic cardiac nerves of the left side were fewer in number in comparison with the cervicothoracic cardiac nerves of the right side. The right vagal cardiac nerves were prominent and the craniovagal and caudovagal fibres innervated the heart. No caudovagal cardiac nerves could be traced on the left side. In one animal the anastomosis of the main caudoventral branches of cervicothoracic ganglion of the right side was present on the right lateral face of the trachea and the caudodorsal cervicothoracic nerve ventral to sympathetic trunk passed through the longus colli muscle and into two branches; one to join with sixth thoracic ganglion and the other ramified posteroventral to the longus colli muscle.

Vet. Sci. 10 Hossain, M. I. and A. H. Talukdar. 1971. **A technique of processing the ruminant stomach for use as a model in the anatomical museum.** *Bangladesh Vet. J.* 5(1-4): 39-42.

The process for the preparation of natural models of water buffalo and goat stomach is vividly described. The technique for fixation and dehydration of ingesta free specimen were accomplished by using formaldehyde solution, industrial methylated spirit and finally the ethyl alcohol. To keep the organism in shape the chambers were packed with the sterilized cotton mixed with fine coconut fibre. Before drying in the sunlight, the organs were cleared off the fatty substances and facia meticulously and finally painted with DDT added transparent varnish. The models thus prepared withstood the local climate and rough handling without any deterioration of any part for the last two years. This process can be practiced in places where laboratory facilities are limited.

Vet. Sci. 11 Hossain, M. I. and A. H. Talukdar. 1971. **The arterial supply to the urogenital system of Black Bengal She-goat.** *Ceylon Vet. J.* 19(4).

In the Black Bengal goat the right and left renal arteries were almost equal in length. The branches from the renal, utero-ovarian and posterior uterine arteries supplied the wall of the ureter. The blood supply to the urinary bladder was derived from the umbilical, posterior uterine and prepubic arteries. The urethra was supplied by the branches of urogenital and internal pubic arteries. The ovaries, right and left were supplied by the ovarian branches of the respective utero-ovarian arteries. The middle uterine, the posterior uterine and the anterior uterine arteries were the arteries to the uterine wall. The urethral and the posterior uterine branches of urogenital artery supplied the vagina. An arterial branch (A. Clitorides) and a vulvar arterial branch of the internal pubic supplied the clitoris and vulva respectively.

Vet. Sci. 12 Mia, M. A. 1971. **The OS Cordis of the water buffalo (*Bubalus bubalis*).** *Bangladesh Vet. J.* 5(1-4) : 15.

The incidence and gross anatomy of the os cordis of twenty one water buffaloes were described primarily to obtain a useful reference for comparative studies of bovine. The average length, breadth and thickness were found to be 6 cm. 1 cm. and 0.4 cm, respectively. The fibrous tissue containing small cartilage was observed on the left aortic fibrous ring. In adult, cartilage loses its translucency and bluish-white color and appears yellowish and cloudy.

Vet. Sci. 13 Hossain, M. I. 1972. **The arterial supply to the adrenal gland of the Black Bengal she-goat.** *Res. Vet. Sci.* 13(3).

Seven adult Black Bengal female goats were used in this study. Three of the animals were injected with latex to demonstrate the arterial distribution to the adrenal gland. The arteries to

this gland were derived from the last intercostal, first lumbar, cranial mesenteric and renal arteries. In 3 of the individuals the branch from the right renal artery to the right adrenal gland was not observed.

Vet. Sci. 14 Mia, M. A. 1972. **Innervation of the horn and horn base of water buffalo (*Bubalus bubalis*).** *Bangladesh Vet. J.* 6(1-4): 17-20.

Twenty water buffaloes were used for this investigation. The nerve to the horn and horn base derived from the cornual nerve and very rarely from infra-trochlear, first and second cervical nerves. Animals in which cornual nerve block is incomplete, analgesia should be supplemented by diffuse infiltration of solution around the entire horn base.

Vet. Sci. 15 Talukdar, A. H. 1972. **Specialized vascular structures in the skin of the horse.** *American J. Vet. Res.* 33(2).

Skin specimens from 35 body areas were collected from 6 freshly killed horses. Sections from 8 other areas were obtained from 3 additional horses. Arteriovenous anastomoses were observed in all 43 areas, but were most consistent and numerous in the ear, coronary border, and papillae of the hoof. In addition to the arteriovenous anastomoses, intra-arterial cushions, with arterial vessels leaving the summit of the cushions, were observed. Vessels that formed coils or convolutions with the appearance of a glomus were present. The vascular bed of the skin plays a very important role in the head-regulating mechanism of the animal body. Blood flow through the capillary beds, especially those in the superficial dermis, is regulated by specialized vascular structures in the deeper layers. The types and morphologic characteristics of these structures in domesticated animal have not been clearly described.

Vet. Sci. 16 Talukdar, A. H. 1972. **Microscopic anatomy of the skin of the horse.** *American J. Vet. Res.* 2365-2390.

Thirteen normal horses (2 to 17 years) were killed, and skin specimens from 49 areas were immediately collected. The skin surface contained grooves and ridges. The hairs erupted in the grooves. The average thickness of the general body skin was 3.8 mm. of the skin from which the permanent hairs (mane and tail) originated, 6.2 mm. The epidermis consisted of 4 layers: stratum basale, stratum spinosum, stratum granulosum, and stratum corneum. The stratum lucidum was absent. Keratohyalin granules and dendritic melanocytes were in the stratum spinosum and stratum granulosum. Basal processes of the cells of the stratum basale anchored the epidermis to the underlying tissue. The dermis consisted of two well-demarcated layers: the superficial or papillary layer containing fine, loosely arranged collagenous fibres and the deep or reticular layer with organized compact collagenous fibre bundles. An extensive network of elastic and reticular fibres was seen throughout the dermis, but was more prominent in the superficial layer. The dermis of the lumbar, sacral, and gluteal regions was modified by the presence of a third layer of collagenous fibres interwoven with fine elastic and reticular fibers. Hairs occurred singly, and the large rectangular cells of the medulla were characteristic. The larger hair follicles contained follicular folds below the

openings of the sebaceous glands. The density of the coat and the size of the individual hairs varied. In thin skin, the angle of the hair was more acute. Usually two sebaceous glands were associated with each hair follicle. Generally the skin near the body openings contained large, branched sebaceous glands. Sweat glands were the apocrine type.

Vet. Sci. 17 Talukdar, A. H. 1973. **The histologic study of the dermo-epidermal junction in the skin of horse.** *Res. Vet. Sci.* 18(3): 328-232.

The cells of the basal layer of the epidermis send fine cytoplasmic processes to the underlying P.A.S. positive basement membrane on which the basal cells rest. The delicate collagenous fibres in the papillary layer of the dermis were indistinct from the finer reticular fibres at the dermo-epidermal junction. Extensive network of elastic and reticular fibres present in the superficial part of the papillary layer and their branches came to the close vicinity of the basal epidermal cells. It is believed that the framework of the basement membrane was formed by the reticular fibres which was also partly supported by the fine elastic fibres. The reticular meshwork in turn filled up by strongly P.A.S. positive substances which ultimately appeared as a homogeneous membrane at the dermoepidermal interface. The penetration of the cytoplasmic processes into the basement membrane, the enmeshing of the reticular and elastic fibres at dermoepidermal junction and the attachment of the reticular fibres to the dermal collagenous fibres, provide the necessary strength of this attachment.

Vet. Sci. 18 Talukdar, A. H. and M. A. B. Khan. 1973. **Follicle population in Black Bengal goat.** *J. Agr. Sci. Combridge, London.* (MS).

Thirty skin samples from 5 body areas of six Black Bengal goats were used in this study. Both the primary and the secondary follicles were observed. The primary occurred in groups of three. Four to 12 secondaries were associated with the trio of primaries. The average number of follicles per sq. mm. was 18.2. The S/P follicle ratio was 2.5/1. The density of follicles was greatest on the croup and lowest at the belly.

Vet. Sci. 19 Mia, M. A. 1973. **A method for establishment of the sex by the great sciatic notch in equine.** *Indian Vet. J.* 50(10).

Observations were carried out on 40 adult equine pelvises, half of them males and the other half females. The objective of this investigation was to discover a method for sexual diagnosis in every iliac bone by the width and depth of the great sciatic notch in equine. In horse iliac bone the index was 2 while in mare it measured 1.5. By this method one can make the sexual diagnosis on every iliac bone even if it is separated or in a bad state.

MEDICINE AND SURGERY

Vet. Sci. 20 Hyder, G. 1961. **Rinderpest and its control in East Pakistan with particular reference to its epidemiology.** *Proc. 13th Pakistan Sci. Conf. Abs. Sec. Agr.66.*

The control and eradication of Rinderpest in East Pakistan is possible but as many as 2,000 men will have to be mobilized and kept going over a long-period in order to make the

Agr. 754 Joarder, O. I. and A. M. Eunus. 1968. **Inheritance of earliness and plant height in an eleven-parent diallel cross of *Brassica juncea***. Sci. Res. 5 (4): 200.

The inheritance of earliness and plant height in an eleven-parent diallel cross of *Brassica juncea* L. was investigated. On an overall basis, earliness and plant height were found to be controlled by both dominant and recessive genes but the contribution of the former was greater. Nineteen dominant factors were detected affecting plant height, whereas seven dominant factors were involved to condition earliness. Heritability was calculated to be 40-44 percent for earliness and 43-72 per cent for plant height.

Agr. 755 Joarder, O. I. and A. M. Eunus. 1970. **Inheritance of some quantitative characters in *Brassica campestris* L.** Pakistan J. Bot. 2 (2): 1-7.

The data collected for four quantitative characters have been analyzed by biometrical techniques. Estimates of K_1 indicate the presence of 1-2 effective factors, whereas those of K_2 suggested the presence of 4-14 effective factors operating for the characters studied. Presence of overdominance and complete dominance was observed in heading-to-ripening and sowing-to-heading period respectively, whereas in the remaining characters no dominance was noted. Transgressive segregation was indicated in both directions for all the characters.

Agr. 756 Eunus, M. and Hossain S. M. A. 1971. **Effect of planting method and seed rate on the performance of two varieties of mustard (*Brassica campestris* L. var. sarson and (*Brassica juncea* L. var. Rai).** Res. Rep. Dep. Agron. Bangladesh Agr. Univ.

Two varieties of mustard namely, Rai-5 and Sarson-9 were grown as broadcast and row-sown crop with four different seed rates of 4.59, 5.14, 6.89 and 8.04 kg/ha at the farm of the Bangladesh Agricultural University, Mymensingh during the period from October 1971 to March 1972. Sarson-9 produced significantly the higher seed yield than did Rai-5. Row seeding was proved to be better than broadcast seeding. Seed rates used ranging from 4.59 to 8.04 kg/ha did not produce any significant difference on the grain yield of mustard.

Agr. 757 Rahman, L. and M. Bechyne. 1971. **Methods of pre-breeding selection for oil content in *Brassica* species.** Oleagineux 26 (12): 773-778.

A suitable rapid micro-technique has been developed for quantitative determination of oil, to minimum quantity of 0.95 mg (one cotyledon of Brassica). The seeds of *B. juncea*, *B. hirta* and (*B. carinata*) show a high variability in oil content even when they have same specific gravity. In weight and oil content of kernel (*B. hirta* and *B. carinata*) the ratios between two cotyledons and hypocotyl, cotyledons separately and hypocotyledon and "half seed" were about 1:1, 1:1:2 AND 1:3 respectively. In weight and oil content of seed the ratio cotyledon: hypocotyl: seed coat was 2:2:1 and the ratio cotyledon: 'half seed': seed coat was 1:3:1. The specific gravity range of seeds of *B. napus*, *B. campestris*, *B. juncea*, *B. nigra* and *B. hirta* varied from 0.80 to 1.24 and that of kernel from 1.16 to 1.26. Large variations between the ranges, in seeds of *B. napus* indicated the presence of considerable air space in the seed.

Medicinal treatment appeared to be of no value. But simple surgical procedure cured most of the animals.

Vet. Sci. 25 Mia, A. S. and H. Islam, 1967. **A preliminary study on the incidence of bovine infertility and the economic loss caused by it.** *Pakistan J. Vet. Sci.* 1(1) : 5-10.

A preliminary survey was made to determine the incidence of bovine infertility in East Pakistan and the economic loss caused by it. Approximately 37% of the adult cows were found to be infertile at the time of survey and the maturity of heifers was found to be delayed, on an average, by 16 months. The total economic loss for infertility and delayed maturity was estimated to be approximately 47 crores of rupees per year in East Pakistan alone.

Vet. Sci. 26 Mia, A. S. and A. Haque. 1967. **Virus diarrhoea in East Pakistan.** *Pakistan J. Vet. Sci.* 1(2) : 22-25.

On the basis of clinical and epizootiological findings, virus diarrhoea was diagnosed for the first time in East Pakistan. It occurred in October 1966 and in January, 1967, in two separate herds at East Pakistan Agricultural University, Mymensingh. The clinical findings of the condition, especially in the 2nd outbreak was very similar to those of virus diarrhoea as reported from other countries.

Vet. Sci. 27 Mia, A. S. and A. Haque. 1967. **Skin diseases in cattle.** *Pakistan J. Vet. Sci.* 1(3): 76-83.

A survey was conducted in 2 subdivisions of Mymensingh to determine the incidence of skin diseases in cattle. Humpsore was found to be most common in cattle followed by Demodectic mange and papillomatosis. Seven to 18 per cent of adult animals were found to be affected with Humpsore with an average of 29 per cent. The incidence of all skin diseases taken together was estimated to vary from 6.3 to 52 per cent on the basis of total cattle population. Augenous vaccine and anthisancream with alum wash were found to be highly effective against papillomatosis and Humpsores respectively.

Vet. Sci. 28 Ali, K. M. and A. Ahmed. 1968. **Milk fever in ruminants.** *Pakistan J. Vet. Sci.* 2(2) : 74-77.

Two clinical cases of milk fever in Jumalpur goats have been reported in Mymensingh and discussed indicating diagnosis and treatment.

Vet. Sci. 29 Hoque, M. M. 1968. **A trial myiasis in Black Bengal goat.** *Pakistan J. Vet. Sci.* 2(1) : 45.

A case of infection with the larval stage of oestrus ovis in a Black Bengal goat of Rajshahi is reported.

Vet. Sci. 30 Islam, A. F. M. H., A. S. Mia, and A. Ahmad. 1968. **Studies on anestrus in bovine.** *Pakistan J. Vet. Sci.* 2(4) : 173-179.

The role of anestrus in infertility of cattle was studied in E.P.A.U. Dairy Farm and 110 females of different breeds of above 2½ years of age were used. an animal was considered fertile if was found either pregnant or with calf of less than 4 months of age. In this study 53.64% of the animals were found fertile. Of these 86.44% was found to be anestrus. Of the anestrus animals 43.14% was post parturient anestrus, 47.59% was post breeding anestrus and 9.8% was virgin animals. Of the anestrus animals 66.66% were found to be due to nonfunctional or hypoplastic ovary, 25.68% were due to persistent corpus between, 6% were due to cystic corpus between and 6% were due to other pathological conditions of the reproductive organs. Non functional or hypoplastic ovary in great majority of those anestrus animals might be due to nutritional deficiencies and / or hereditary factors.

Vet. Sci. 31 Mia, A. S. and A. Hoque. 1968. **Further studies on virus diarrhoea in East Pakistan.** *Pakistan J. Vet. Sci.* 2(1) : 24-32.

Experimental transmission studies were carried out with the infective materials collected from a reported outbreak of a Rinderpest like disease which was diagnosed as virus diarrhoea. The condition could be transmitted to cattle and goat by injecting either blood or spleen suspension from infected animals. Materials from experimentally infected goat were found to be infective in cattle and goat. In cross immunity test, the condition was found to be different from Rinderpest.

Vet. Sci. 32 Rahman, A., A. Ahmed, M. A. Ali, A. S. Mia, and K. M. Ali. 1968. **N-butyl alcohol and formalin in the treatment of "Bloody Milk" in local cows and buffaloes.** *Pakistan J. Vet. Sci.* 2(3) : 159-161.

A total of 44 cows and 5 buffaloes suffering from the condition known as "Bloody milk" have been treated with 5% formalin 7% N-Butyl alcohol in the dose of 1 cc per 20-30 lbs. body weight intravenously. The treatment indicated that 96% of the animals having this condition in one quarter recovered by one injection of either drugs. No side effect was observed with N-butyl alcohol administration though in 3 cows treated with formalin developed dyspnea, excitation and bulging of eyes which disappeared after 5-10 minutes.

Vet. Sci. 33 Rahman, A., A. S. Mia, and K. M. Ali. 1968. **A preliminary report on an outbreak of hemorrhagic gastroenteritis in cattle of unknown etiology.** *Pakistan J. Vet. Sci.* 2(1) : 38-40.

An outbreak of the condition was reported in Kotwali, P. S. Mymensingh. A total of 29 animals were effected during 1 months period. The course of the disease was very acute and the animals died within 24-48 hours after the onset of disease. The diseased animals revealed temperature 104°F to 106°F, bloody diarrhoea prostration unclotted cherry blood, sevee haemorrhagic and ulceration inflammation of abomasum, doudenum, collon and lower part of large intestine. Other parts of intestine were moderately congested. Bacteriological and

protozoal investigations were negative. Test for arsenic, mercury and nitrate poisoning were negative. Feeding and inoculation of intestinal whole blood to cattle failed to reproduce the disease.

Vet. Sci. 34 Rahman, M. M., M. L. Dowan and M. A. Hauque. 1969. **Some observations on the pathology and immunology of infections papilloma in the cattle of East Pakistan.** *Pakistan J. Vet. Sci.* 3(2) : 86-90.

Pathological observations on infections papilloma in cattle were made in Mymensingh district. Six infected animals studied were below 3 years of age. Autogenous vaccine was prepared and mounted subcutaneously into two infected calves at a lapse of 6 weeks. Recurrence of neoplasm could not be ascertained. This indicated that autogenous vaccine has some positive effect in the treatment of neoplasm. They observed in complete immunity in cattle and was thought to be due to different strains of papilloma virus and suggested detailed virological studies.

Vet. Sci. 35 Rahman, B. and M. A. Barya. 1969. **Studies on the periodicity of oocyst production in *Eimeria tenella* and histopathological changes in the caeca of infected chicks.** *Pakistan J. Vet. Sci.* 3(1) : 28-32.

Studies on the diurnal periodicity of production of *Eimeria tenella* oocyst shows that their number increased markedly from 3 P. M. to 9 P. M. and declined at any other hours of the day, irrespective of the time inoculation of the infective agent. The pathological changes following infection were thickening of the lining of caecal lumen, laceration and haemorrhages of varying sizes and degrees, hyperplasia, varying degrees of degeneration and infiltration of mucosa and submucosa of the caecum.

Vet. Sci. 36 Ali, K. M. and T. I. M. F. R. Choudhury. 1970. **Haematological studies in virus diarrhoea in goat.** *Bangladesh J. Vet.* 4(1-4) : 31-35.

Ten goats inoculated with spleen suspension containing virus diarrhoea like organisms studied for haematological value. The studies revealed an average fall of 14% and 11% of the pre-infection level in the total R. B. C. and W. B. C. counts respectively. The differential counts showed an absolute neutropenia and relative lymphocytosis and the average fall in neutrophils was 51.5% and the average increase in lymphocyte was 37.3% of the pre-infection level. There was also fall in monocytes with an average of 45% of the pre-infection level. The average fall in haemoglobin and haematocrit was 9.4% and 16.6% of the pre-infection levels respectively. No change in erythrocyte sedimentation rate was observed.

Vet. Sci. 37 Dewan, M. L. and M. M. Rahman. 1970. **Isolation of microorganisms from stephanofilariasis (Humpsore) and their roles in the initiation of the disease.** *Bangladesh J. Vet. 4(1-4) : 25-30.*

Twelve skin biopsies of naturally occurring Humpsore lesions were studied and the following organisms were isolated : *Staph. aureus*, *Staph. albus*, *Staph. epidermidis*, *B. coagulans*, *B. circulans*, *B. subtilis* and an unidentified filamentous bacteria. Amongst the organisms *Staph. aureus* and *Staph. albus* have been found to be most pathogenic, when injected intradermally at the hump region of adult zebu. Intradermal inoculation of *Staph. aureus* and *Staph. albus* at the hump region of adult cattle resulted in sloughing of epidermis in two weeks. The lesions so produced when exposed to flies (*Musca conducents*) in nature developed into humpsore and the parasite *Stephanofilaria assamensis* and their eggs were recovered from the lesions 72 days after bacterial inoculation. The findings clearly indicates that *Staph. assamensis* becomes adult in the skin tissue about 2 months after entrance. It appeared that *Musca conducents* the intermediate host of *Staph. assamensis*, is unable to inject the infective larvae of *Staph. assamensis* through healthy skin but may deposit them in the exudative lesions, produced by other agent such as bacteria in injury. In nature, it may be possible that the bacterial get entrance to the skin through the bites of some biting flies which are abundantly present in the environment.

Vet. Sci. 38 Ali, K. M., R. I. M. F. R. Choudhury and A. J. Sarker. 1971. **The pathogenic characteristics of the causal agent of virus diarrhoea like condition in laboratory animals.** *Bangladesh Vet. J. 5(1-4) : 59-64.*

Studies on the pathogenicity in the developing chicken embryos and rabbit were carried out with the organisms of the virus diarrhoea like syndrome in cattle and buffaloes in Bangladesh. The chicken embryos were found to be relative resistant to the virus. Rabbit showed slight fluctuation of temperature during the two weeks of temperature during the two weeks period of observation and no other changes were observed in rabbit.

Vet. Sci. 39 Huque, A. K. M. F. and A. Rahman. 1971. **Studies on an outbreak of virus diarrhoea in buffaloes.** *Bangladesh Vet. J. 5(1-4) : 53-58.*

The natural outbreak of virus diarrhoea in buffaloes in Mymensingh is reported. The clinical symptoms, and P. M. lesions were described and the diagnosis of the disease is made in laboratory and cross immunity test with Rinderpest.

Vet. Sci. 40 Haque, M. A. and E. Kral. 1972. **Clinical symptoms in induced traumatic reticuloperitonitis in goats.** *Bangladesh Vet. J. 6(1-4) 9-16.*

Traumatic reticuloperitonitis was induced experimentally by oral administration of sharp sewing needles in twelve goats. The goats were of one to seven year old. The salient clinical manifestations were as follows : increased respiration and pulse rates, rise of temperature, alternation of ruminal movement rate, anorexia, dullness, depression, pain response at the

ziphoid and reticular regions, marked decrease in milk yield in milch goats, occasional slight tympany and loss of body weight. The foreign bodies after penetrating through the reticular wall injured the different internal organs and/or structures and produced the following separate entities : traumatic pericarditis, pneumonia and pleurisy, hepatitis, abomasitis and abscess in the different organs or structures. The ratio between uncomplicated traumatic reticuloperitonitis and traumatic reticuloperitonitis complicated with other sequelae was 1:11. Two goats died: one is due to traumatic pericarditis and the other due to traumatic pneumonia pleurisy.

Vet. Sci. 41 Rahman, M. A., K. M. Ali and A. Raham. 1972. **Incidence of diseases of cattle in Mymensingh.** *Bangladesh Vet. J.* 6(1-4) : 25-30.

A survey was conducted on cattle of Mymensingh to find out the occurrence of different diseases during a three year period. The commonly encountered diseases were Foot and Mouth disease, Haemorrhagic septicemia, mastitis, black leg, gastrointestinal nematode and other helminth infestation, Fascioliasis, Humpsore, mange, coccidiosis, babesiosis, tritestation, maggot infested wounds, respiratory disorders, such as chronic bronchitis, rhinitis, pneumonia, chronic pulmonary emphysema, pulmonary ecchynococcosis, Crenito urinary disorders such as infertility, retention of placenta, pothitis, vaginitis, metritis, paraphimosis, abortion, urolithiasis, prolapse of vagina and uterus: Gastrointestinal disorders such as diarrhoea, enteritis, indigestion, tympany impaction and colic. Other disorders were also noted such as anorexia, anaemia, debility, traumatic injury and burn. The commonest disease of cattle was found to be parasitic infestation.

Microbiology

Vet. Sci. 42 Israil, M., M. A. Quader and G. Hyder. 1961. **Duration of potency of anthrax spore suspension at refrigerator and room temperature and the rate of decrease in its spore contents.** *Pakistan J. Sci. Res.* 13(1) : 33-37.

A brew of Sterne's avirulent spore suspension in 50% (by volume) glycerine saline was prepared to study its keeping quality. It was divided into two lots. One lot was stored in a refrigerator at 0-5°C and another lot at room temperature to study the rate of decrease in its spore content. Periodical counts of spore contents of these lots were made upto 23 months. Gradual decrease in number of spores was noticed in the lot stored at room temperature. The decline was partially arrested after initial fall in the lot stored in the refrigerator. Vaccines prepared from both the suspensions stored for 22 months were found to be potent.

Vet. Sci. 43 Quader, M. A. 1963. **Ranikhet disease oral vaccine-I.** *Agr. Pakistan.* 14(3) : 286-289.

Possibilities of introducing an oral vaccine against Ranikhet Disease in Bangladesh conditions and climate were studied. In this study R.D. Muk. strain virus administered orally in indigenous chicks and adult fowls in 0.25 c.c. to 1 c.c. doses of 1 in 200 dilution of allanto-

amniotic fluid virus was found to be able to set up immunity in treated chicks and fowls. A few of the treated very young chicks specially of exotic breeds reacted with this strain. It was found safe for adult fowls, pullets and cockerels and indigenous chicks of 1 month of age.

Vet. Sci. 44 Hyder, G., M. Israil and E. Rahman. 1964. **Studies on combined black quarter and haemorrhagic septicaemia vaccine.** *Pakistan J. Sci.* 16(1) : 23.

Alum precipitated Haemorrhagic Septicaemia and Black Quarter Vaccines prepared separately from strains of *Past. multocida* and *Cl. Chauvoei* were adjusted to Brown's opacity tube. No. 20 which were then mixed together (50:50) and tested on sheep and bullcalves at different doses. The mixed vaccine administered on sheep and bullcalves was found to be safe and conferred an active immunity against both diseases. The mixed vaccine was also found to retain its immunising properties upto 12 months (so far tested) while stored at 0 to 5°C. There was no indication of change in the degree of immunity in case of vaccinated animals when the challenge doses was increased from 10 MLD to 50 MLD.

Vet. Sci. 45 Israil, M., M. A. Quader and G. Hyder. 1965. **Haemorrhagic septicaemia alum precipitated vaccines.** *Bull. off. Int. Epiz.* 64, 33 Session General.

Several brews of alum precipitated vaccines were prepared and tested in 261 animals to compute dose to find out its keeping quality at room and refrigerator temperatures and duration of immunity conferred by it with single and double vaccination. Number of control animals used in these tests were 99. It was proved to be efficacious and able to impart long lasting immunity in a dose of 5 c.c. of opacity 10 x 2 (Brown's). The immunity produced with single and double vaccination in a dose of 5 c.c. was found to last for 5 months and 11½ months respectively on an average. the minimum and maximum duration of immunity observed with single vaccination was 4 months and 6 months respectively, and with double vaccination was 7 and 16 months respectively. It was found to be potent at room temperature ranging from 18° to 35°C for 12 months and for 30 months refrigerator temperature (5°C) tested so far.

Vet. Sci. 46 Choudhury, M. U. A. and M. L. Dewan. 1967. **Immature linguatulosis in a murrah buffalo.** *Pakistan J. Vet. Sci.* 1(3) : 73-75.

Immature linguatulosis in a Murrah buffalo is recorded and is thought to be the main factor responsible for the poor state of health of the animal in absence of other demonstrable cause. Presence of poor sanitary condition, primitive system of meat handling and disposal of offals indicate that it may be an important parasitic disease of public health significance in East Pakistan.

Vet. Sci. 47 Choudhury, T. I. M. F. R., M. U. A Choudhury and M. Rahman. 1967. **Microflora of milk in a single dairy heard.** *Pakistan J. Vet. Sci.* 1(2) : 3-8.

Microflora of milk were studied in 132 milk samples from 65 normal lactating animals. The results indicate the presence of 20% hemolytic and non-hemolytic streptococcus, 45% staphylococcus, 24% *Bacillus subtilis*, 56% *Lactobacillus*, 25% *Escharchia* and 30% *Pseudomonas*. Distribution of streptococcus and staphylococcus, pseudomonas and escharichia as observed indicate the prevalence of subclinical and clinical form of mastitis in the herd.

Vet. Sci. 48 Choudhury, T. I. M. F. R. and M. U. A. Choudhury. 1967. **Listeriosis in cattle in East Pakistan.** *Pakistan J. Vet. Sci.* 1(2) : 29-31.

Listeria monocytogenes is recorded from the brain of a cow in East Pakistan. This organism is identified on the basis of morphology, growth, cultural characteristics, biochemical properties and laboratory animal inoculation test. The organism caused abortion in Guinepig but the abortion was not associated with meningitis and the organism could not be isolated from the brain of Guineapigs.

Vet. Sci. 49 Al-Mahmud, K. A., T. I. M. F. R. Choudhury and M. U. A. Choudhury. 1968. **Isolation of salmonella from poultry feeds.** *Pakistan J. Vet. Sci.* 2(3) : 134-139.

One hundred and fifty samples of poultry feeds used in East Pakistan Agricultural University Poultry Farm were examined to isolate *Salmonella pullorum* and or *Salmonella gallinaum*. Gram negative bacillus was observed from almost all the cases, but only two samples were found to be contaminated with *Salmonella pullorum* and indicated the percentage of isolation as 1.33.

Vet. Sci. 50 Choudhury, T. I. M. F. R. and L. C. Grumble. 1968. **Growth and nutritional requirement of selected strains of *Morazella bovis*.** *Pakistan J. Vet. Sci.* 2(4) : 180-182.

C-1 strain of *Morazella bovis* was grown in six different media containing a wide range of nutritional requirements. The growth of the organisms was luxurious in the following media ; (a) Trylose agar (b) Bordet gengen agar + 8% citrated bovine blood (c) Bordet gengen agar + 28% bovine blood + 2% ribonucleic acid + 2% choline + 2% inositol (d) Tissue culture media 199 + 2% agar + 8% bovine blood. The other two media were unsatisfactory.

Vet. Sci. 51 Hyder, G. 1968. **Observation on the relative efficacy of alum precipitated, alhydrogel adsorbed and buffer treated black-leg vaccine.** *Pakistan J. Vet. Sci.* 2 : 91.

Six types of Black-Leg Vaccines were prepared from the two highly antigenic strains of *Clostridium chauvoei* received from Glaxo Research laboratory at Middlesex, England in two different culture media i.e. Papain digest of beef and beef infusion. The 24 hour cultures were vated with formalin at 0.5% conc (final volume) of culture and were then divided into there equal parts. The three parts were treated separate with 1% potassium aluminium sulphate; 2%

aluminium hydroxide gel and M/50 Phosphate buffer respectively. The volume of all the vaccines were adjusted separately by adding M/50 phosphatic buffer in such as proportion so as to contain 2×10^8 cells per mililitre. All the vaccines were tested in 54 guinea pigs taking 9 guinea pigs in each batch and each guinea pig received 2 ml. of each vaccine subcutal neously as primary dose followed by a booster dose of 2 ml. after two weeks. Twelve guinea pigs were kept as unprotected control. The vaccinated and control pigs were challenged with the corresponding virulent strain of *Cl. chauvoei* weeks after the 2nd inoculation. Alum precipitated as well as Alhydrogel treated Vaccines were found to be antigenically superior on test to the ordinary buffer treated vaccines.

Vet. Sci. 52 Rahman, M. M. and M. L. Dewan. 1968. **Isolation of pathogenic pasteurella organism from liver fluks collected from gall bladder of a bullock died of haemorrhagic septicaemia.** *Pakistan J. Vet. Sci.* 2(4) : 183-186.

Pasteurela multocida was isolated from liver fluks (*Fasciola gigantica*) obtained from gall bladder of bullock died of Haemorrhagic septicaemia. The organism was highly virulent for rabbits which died in 18 and 4 hours following intraperitoneal inoculation of nutrient broth culture. The rate of parasites in the dissemination of the disease is determined.

Vet. Sci. 53 Rahman, M. A., T. I. M. F. R. Choudhury and M. U. A. Choudhury. 1968. **Distribution of different strains of staphylococcus from mastitic and apparently normal bovine mammary gland.** *Pakistan J. Vet. Sci.* 2(2) : 63-67.

Eighty two milk samples from the cow of East Pakistan Agricultural University Dairy Farm were examined, of which 35 revealed the presence of staphylococci which indicated the incidence of staphylococcal mastitis in the form as 42.68%. Out of 35 isolates of staphylococci the incidence of staphylococcus pyogenes var-aureus, staphylococcus pyogenes var-albus and staphylococcus epidermidis was 29.26, 8.53 and 4.87% respectively.

Vet. Sci. 54 Rahman, M. A., T. I. M. F. R. Choudhury and M. U. A. Choudhury. 1968. **Studies on *in vitro* and *in vivo* sensitivity of the different strains of staphylococcus of bovine mammary gland origins to selected antibiotics.** *Pakistan J. Vet. Sci.* 2(3) : 109-118.

The *in vitro* and *in vivo* sensitivity tests of different strains of staphylococci to 8 selected antibiotic were conducted. The results show that all the isolated strains of staphylococcus pyogenes var-aureus were sensitive to Tetracycline and Chloromphenical but 65.66%, 75%, 91%, 66%, 83.33%, 58.33% and 50% of the strains were sensitive to Penicillin dehydrostreptomycin, neomycin, erythromycin, novobiocin and dehydromycin respectively. All the isolated strains of staphylococcus pyogenes var-albus were sensitive to tetracycline and chloromphenical but only 57.14% to novobiocin and 42.85% to lineomycin. Among the strains of staphylococcus epidermidis all were sensitive to tetracycline and chloromphenical but 75% sensitive to neomycin, erythromycin and dehydrostreptomycin and 50% to penicillin, novobiocin and lincomycin. For *in vivo* sensitivity test chloromphenical was

found to be 100%, erythromycin 75% and both penicillin and dehydrostreptomycin 50% effective.

Vet. Sci. 55 Ahmed, Z. 1969. **Studies on the immunization of baby chicks coming from immuned mothers against Ranikhet disease using the 'F' strain vaccine prepared in East Pakistan.** *M. Sc. (Vet. Sci.) Thesis. East Pakistan Agr. Univ. (MS).*

Studies were made on the immunization of baby chicks with 'F' strain vaccine and the result revealed the fact that there was no correlation between the immunity produced and H₁ titus in chicks when the F strain vaccine was given intraocularly. Higher concentration of vaccine and intraocular route of inoculation in baby chicks showed better immune response. The freeze dried vaccine could be kept for 3 weeks at room temperature at least 7½ months under frigidare and freezing conditions.

Vet. Sci. 56 Rahman, M. A. 1972. **Microbial contamination of fish and their public health significance.** *M. Sc. (Vet. Sci.) Thesis. Bangladesh Agr. Univ. (MS). 52 p.*

Studies were made to determine the incidence of Microorganism in different tissues of Punti fish and Hilsa fishes. It was observed that the microbial count in Hilsa fishes was higher than the Punti fish. The organism as isolated from the intestinal contents of fishes was of the same type as found in water. the experiment revealed the fact that innumerable opportunities were provided for heavy contamination of Hilsa fishes which naturally showed higher bacterial load. This can be avoided by reducing transportation materials, effective application of sanitation and hygiene all the way from the harbour to the market.

Vet. Sci. 57 Rahman, M. A. 1972. **Microbial contamination of meat and their public health significance.** *M. Sc. (Vet. Sci.) Thesis. Bangladesh Agr. Univ. (MS). 52 p.*

The total bacterial count per gram of meat samples obtained from freshly slaughtered animal and Town Market and the percentage distribution of various kinds of microflora isolated from meat samples were determined. The average total bacterial population in all the samples was 6,452,000 to 53,303,000 and the town market samples showed higher bacterial count which signifies the fact that meat in relation to public health is influenced by its hygienic production and distribution. Only a good meat hygiene system which includes supervision of the meat production chain from the farm through transport to well run abattoir to distribution to the consumer and useful and effective legislation could safegurd meat against undue bacterial contamination.

Vet. Sci. 58 Amin, M. M., T. I. M. F. R. Choudhury and M. U. A. Choudhury. 1969. **Isolation of salmonella from wild birds, rodents and insects.** *Pakistan J. Vet. Sci. 3(2) : 41-47.*

Twenty five crows, twenty five rats and fifty cockroaches were examined to determine the incidence of salmonellae. A total of 300 swabs from the cloaca, legs and beaks of crows, 750

samples of the intestinal contents from all the three agents and another 250 samples of macerated body materials of cockroaches were investigated for the survey. Salmonella organism were not found in any of the swabs. Salmonella typhimurium was isolated from intestinal contents of two crows only. Rodents (rats) revealed the presence of salmonella enteritidis in two instances and that of Salmonella typhimurium in one. Salmonella enteritidis was isolated from two cockroaches. Incidence of Salmonellae was found to be eight per cent in wild birds, twelve per cent in rodents while four per cent in insects.

Vet. Sci. 59 Islam, S., T. I. M. F. R. Choudhury, A. J. Sarker and M. U. A. Choudhury. 1969. **Pathogenicity of the selected East Pakistan isolates of newcastle disease virus.** *Pakistan J. Vet. Sci.* 3(4) : 138-143.

Attempts were made to characterize the two locally isolated of Newcastle disease virus by their pathogenicity on chicks and chicken embryos. Mean death time of EMLD of My⁻¹ and My⁻² isolates was 51.20 and 52.80 hours respectively. Both isolates when inoculated intracerebrally in day old chicks killed all of the chicks within a period of 8 days. Intramuscular inoculation of six-week old chickens with both the isolates caused the death of all chickens within a period of 12 days. The result indicates that the two My⁻¹ and My⁻² of Newcastle disease virus are highly pathogen and could be classified as velogenic type of NDV.

Vet. Sci. 60 Khan, W. A., A. J. Sarker and M. U. A. Choudhury. 1969. **Incidence of fungi in the upper respiratory tract of chicken.** *Pakistan J. Vet. Sci.* 3(4) : 154-160.

Tracheal and lung samples from 175 chicken were examined to study the fungal incidence in the respiratory tract of chicken. Out of the samples studied 128 tracheal and 74 lung samples were positive for fungal isolation respectively. The incidence of fungi in the respiratory tract of chickens was found to be about 58% of which about 74 and 26% of the incidence were due to *Aspergillus* species and other species of fungi respectively. The isolated groups were *Aspergillus*, *Penicilium*, *Mucor* and *Rhizopus*. The isolated species of *Aspergillus* were *Aspergillus fumigatus*, *Aspergillus clavatus*, *Aspergillus glaucus* and *Aspergillus niger*. *Aspergillus fumigatus* was the only pathogenic species isolated.

Vet. Sci. 61 Rahman, M. A. and J. C. Ramge. 1969. ***Streptococcus uberis* infection in bovine udder.** *Pakistan J. Vet. Sci.* 3(4) : 148-153.

200 milk samples from apparently healthy Quarters of 10 cows were investigated during a period of 10 weeks. *Str. uberis* was isolated from the milk samples and its persistence in the Quarters was studied. *Str. uberis* was identified by typical cultural characters on blood agar, blood esculin ferric citrate agar and by biochemical reactions such as splitting of esculin, hydrolysis of Na-hyppurate, fermentation of mannitol, sorbitol and inulin. *Str. uberis* was isolated from 81 (40.5) of the samples. Forty nine (24.5%) of the samples yielded no pathogenic bacteria. Fifty four of the isolates of *Str. uberis* were typical and showed the

characteristic biochemical reactions. It was found that the organism persisted in the infested Quarters during the entire period of study.

Vet. Sci. 62 Sarker, A. J. 1969. **Trypsin and ultrasonic treatment in the titration of fowlpox viruses.** *Pakistan J. Vet. Sci.* 3(3) : 97-104.

The two strains of Fowlpox virus were treated with trypsin and ultrasonic waves separately to evaluate their effects in virus titrus. Ultrasonic treatment was found more effective in releasing and dispersing the virus particles and to increase the fowlpox virus in PFU though the ELD₅₀ and EID₅₀ titrus were not found to have increased. Trypsinization did not increase the titre of the Fowlpox viruses significantly. Excess variation in PFU counting technique was observed. Comparison of ELD₅₀ EID₅₀ and PFU in the titration of Fowlpox viruses revealed that EID₅₀ titre was more consistent than the other methods used in this study.

Vet. Sci. 63 Sarker, A. J. and L. C. Grumbles. 1969. **Fowl pox viremia in Turkeys.** *Pakistan J. Vet. Sci.* 3(1) : 1-5.

Eight Turkey were inoculated with fowl pox viruses to study the viremia in Turkeys following recovery from fowl pox infection. The fowl pox viruses could not be isolated from the convalescent Turkey serum collected 3 to 4 weeks after experimental infection or after the disappearance of lesions.

Vet. Sci. 64 Ali, M. R. and A. T. Sarker. 1970. **A preliminary study on the incidence of salmonella in the intestine of cattle in Mymensingh.** *Bangladesh Vet. J.* 4(1-4) : 37-44.

The study of the intestinal contents of 75 slaughtered cattle and faecal samples of 100 apparently healthy cattle revealed the presence of Salmonella. In all the samples of three slaughtered and two apparently healthy cattle indicating the incidence of salmonella in 4% and 2% of the cattle studied respectively. All the five isolates isolated from 5 animals revealed the same morphological, cultural and biochemical characteristics of salmonella. All the isolates responded in the agglutination test with "C" "K" antisera of the salmonella "O" and "H" antisera groups (Difco) respectively, and thereby identifying the organism as salmonella block on the basis of Kauffman-white scheme.

Vet. Sci. 65 Karim, M. R. 1970. **A survey of bacteria of dead chicken embryo which were get to hatch in the East Pakistan Agricultural University Poultry Farm.** *M. Sc. (Vet. Sci.) Thesis. East Pakistan Agr. Univ. (MS).* 46.

275 yolk samples of dead chicken embryo and fresh eggs which were get to hatch in the East Pakistan Agricultural University Poultry Farm were cultured for bacteria. The organism isolated were Salmonella 3.6% E. coli 61.4%, Staphylococcus 26.5% Pseudomonas 7.2% Proteus 4.7% Streptococcus 2.7% and Aerobacter 1.5%. 32% of the samples were sterile. The species of salmonella isolated were *Salmonella pullorum*, *S. gallinarum*, *S. typhimurium* and *S. enteritidis*.

Vet. Sci. 66 Rahman, A. and J. C. Range. 1970. **Some biochemical characters of staphylococci and their relationship to leukocytic responses in bovine udder.** *Bangladesh Vet. J. 4(1-4) : 20-24.*

Cultures of 200 milk samples from 10 cones yielded 125 isolates of staphylococci. The biochemical tests used to characterize the strains were coagulase test, hemolytic activity, fermentation of mannitol and pigment production on Chapman stone medium. The relationship of number of high leukocytic responses with the frequency of isolation of staphylococci and their biochemical properties were determined. It was observed that udder having high leukocytic counts produce significant number of hemolytic and coagulase positive staphylococci. Fermentation of mannitol and pigment production on chapman stone medium were not associated with leukocytic responses of the udder. A positive correlation was found between the number of the high leukocytic responses in quarters and the number of times that the staphylococci were isolated from them. Coagulase and hemolysis production were more frequently seen in the isolates as the number of high leukocytic responses increased.

Vet. Sci. 67 Ullah, M. S. 1970. **The immunization on dairy cattle against staphylococcal mastitis.** *M. Sc. (Vet. Sci.) Thesis. East Pakistan Agr. Univ. (MS). 53.*

The study revealed the fact that *Staphylococcus* was present in 44.28% of apparently normal and 90% of acute mastitic cows. Of them *Staphylococcus aureus* was present in 30% and 80% in apparently normal and acute mastitic cows respectively. the positive reaction indicated the prevalence of subclinical form of Mastitis in the herd. *Staphylococcus aureus* was found to be antigenic in rabbits and cows.

Vet. Sci. 68 Huq, A. Y. M. A. and L. C. Grumbles. 1971. **A comparison of *Pasteurella multocida* isolated from healthy cattle and cattle with shipping fever. (1) pasputics and types of *Pasteurella multocida* isolated from healthy cattle.** *Bangladesh Vet.J.5(1-4):19-27.*

N and swab from three hundred healthy animals were examined for the presence of *P. multocida*. Only three per cent of the animals were found to harbour the organism in their nasal passages. Of the nine isolates of *P. multocida*, 3 were Type A, 2 were type B and 2 could not be typed according to Carters method.

Vet. Sci. 69 Rahman, M. A. 1971. **Leukocytic reaction of bovine udder in *Streptococcus uberis* infection.** *Bangladesh Vet. J. 5(1-4) : 43-46.*

The leukocytic response of the bovine udder sub-clinically infected with *Str. uberis* and persistently studding the organisms in milk was studied. The leukocyte content of the milk samples from the infected quarters was determined by Wisconsin mastitis test. It was found that 69.1% of the samples showed a low leukocyte count, 24.6% of the samples showed a high count. From these findings, it may be concluded that *Str. uberis* infection elicits a low leukocytic response in the maximum number of Quarters.

Vet. Sci. 70 Quader, M. A. 1971. **Methods of immunization against newcastle disease.** *Action 9(2) : 18-22.*

The study was conducted to explore the possibility of introducing oral, nasal and ocular vaccines under Bangladesh conditions and climate. Allanto-amniotic fluid harvest of Mukteswar, B1 and F strain virus suspended in normal saline solution were tried in indigenous and exotic breed of poultry through oral, nasal and ocular routes. Of the three routes, the ocular route was found to be the best. Mukteswar strain virus could be used for immunizing chicks over one month of age and older fowls. Immunity produced by it lasted for 4½ months in pullets and cockerels. B1 and F strains were found to be suitable for immunizing chicks upto one moth of age. Thousands of chicks from local poultry farms wee vaccinated with B1 virus orally, nasally or orcularly. No untoward reaction or breakdown of immunity was reported. H.1. tests conducted 2-3½ months after immunization of young chicks with BI and F strains indicated that immunity would last for about two months.

Vet. Sci. 71 Sarker, A. J. 1971. **The immune response in Turkeys infected with fowl pox viruses.** *Bangladesh Vet. J. 5(1-4) : 29-38.*

The convalescent sera of fowl pox virus (TS-100 and TV-200 strain) infected Turkeys were studied to measure the immune response using the neutralization test. The study revealed that fowl pox viruses were neutralized by the convalescent Turkeys sera though the neutralizing capacity of sera was much less than that of chickens. The mean neutralizing dose of convalescent Turkeys sera expressed in ELF_{50} , EID_{50} and PFU against the TS-100 strain were 17.73, 81.55 and 2278.50 respectively and those against the TV 200 strains were 12.92, 23.13 and 98.56 respectively. The viral neutralizing capacity of sera produced in Turkeys and chickens against TS-100 strain was consistently higher than that of those produced against TV-200 strain.

Vet. Sci. 72 Choudhury, K. A. 1972. **Studies on the incidence of corynebacterium pyogenes and species of staphylococci in mastitis.** *M. Sc. (Vet. Sci.) Thesis. Bangladesh Agr. Univ. (MS).*

The organisms, species of *Staphylococci* and *Corynebacterium pyogenes*, isolated from clinical and sub-clinical cases of mastitis were tested for antibiotics sensitivity using Penicillin, Streptomycin, Terramycin and Chloromycetin. Among the 6 isolates of *Strep. pyogenes* only one was sensitive to terramycin but all were resistant to penicillin. Out of 10 isolates of *Strep. agalactiae*. One was sensitive to penicillin, 2 were sensitive to streptomycin and 7 were sensitive to terramycin. Of the 8 isolates of *Strep. dysagalactiae* 2, 3 and 5 isolates were sensitive to penicillin, streptomycin and terramycin respectively. Among the 10 isolates of *Strep. uberis* one was resistant to penicillin, 8 were resistant to streptomycin and 3 were resistant to terramycin. Out of 30 isolates of *Cory. pyogenes*, 3 were sensitive to penicillin, 8 were sensitive to treeptomycin, 21 were sensitive to terramycin. All the 64 isolates were found to be most sensitive to chloromycetin.

Vet. Sci. 73 Choudhury, K. A. 1972. *In vitro* antibiotic sensitivity of few species of *Staphylococci* and *Cory. pyogenes*. M. Sc. (Vet. Sci.) Thesis. Bangladesh Agr. Univ. (MS).

Two hundred and two milk samples from sub-clinical and eighteen milk samples from clinical cases of mastitis were examined in this study to investigate *Cory. pyogenes* and species of *Staphylococci*. Out of 202 sub-clinical cases 6 (2.97 percent) were positive for *Strep. pyogenes*, 14 (6.94%) of *Strep. agalactiae*, 8 (3.96%) for *Strep. dysgalactiae*, 12 (5.94%) for *Strep. uberis*, 38 (18.81%) for *Cory. pyogenes* and 15 (7.48%) for both *Cory. pyogenes* and *Streptococci*. From 18 clinical cases 3 (16.66%) were positive for *Strep. agalactiae*, 2, 11.11%) for *Strep. uberis*, 3 (16.66%) of *Cory. pyogenes* and 2 (11.11%) for mixed organisms of *Cory. pyogenes* and *Streptococci*.

Vet. Sci. 74 Hossain, W. I. M. A. 1972. **Pathogenic characteristics of the selected strains of newcastle disease virus from Bangladesh.** M. Sc. (Vet. Sci.) Thesis. Bangladesh Agr. Univ. (MS). 48.

NDV isolates, RAN 6 and CHT-9 isolated from Rangpur and Chittagong districts, were propagated in 10 day old chicken embryos by allantoic route of inoculation and their pathogenic characteristics were studied. It was revealed that both the isolates killed the embryos in 32 hours. Mean death time (MDT) of EMLD of RAN 6 and CHT-9 was 44 hours and 48 hours respectively. The isolates killed all the day old chicks withing 6 days when inoculated intracerebrally and 5 days when inoculated through *intramascular* route in six week old susceptible chickens. The result indicates that the two isolated of NDV, RAN-6 and CHT-9 are highly pathogenic and classified as velogenic type.

Vet. Sci. 75 Hossain, W. I. M. A. 1972. **Comparative serological study of the selected strains of NDV of Bangladesh with GB, DK1155 and B₁ strains of NDV of U.S.A.** M. Sc. (Vet. Sci.) Thesis. Bangladesh Agr. Univ. (MS). 48.

Serological study of the selected isolates of NDV, RAN-6 and CHT-9 were studied. The experiment showed that the neutralizign antiserum of RAN-6 and CHT-9 of local selected isolates provided a high degree of protection when used against the isolates RAN-6 and CHT-9 respectively. But the antiserum of GB, DK1155 and B₁ strains of NDV provided comparatively less protection when used against the local selected isolates RAN-6, CHT-9 of NDV. The Haemagglutinating antisterum of the isolates RAN-6 and CHT-9 provided a high decree of H.I. activity, when used against, the isolated RAN-6, CHT-9 respectively as measured by H.I. test. But antiserum of GB, DK1155 and B₁ strains of NDV provided comparatively less H.I. activity, when used against the isolates RAN-6 and CHT-9 as measured by HI test.

Vet. Sci. 76 Ahmed, Z., A. Hakim, M. Islam, M. Hussain, and M. Asadullah. 1973. **Studies on the loss of virus in the process of preparation of freeze dried Ranikhet disease (newcastle) vaccine with Mukteswar strain prepared in the livestock research institute Dacca.** *Departmental Report (MS).*

Loss of virus observed in the different stages of preparation of Ranikhet disease (Newcastle) Vaccine prepared from the chicken embryo and allantoic fluid with Mukteswar Strain. The observation was made in 3 stages : (a) after freeze drying of the vaccine in primary freeze drying machine for overnight not above 70°F. room temperature. (b) after necking of the glass ampoules (containing freeze dried vaccine materials) in Oxy-acetelene flame in ordinary room temperature. (c) after final sealing of the glass ampoules in complete vacuum conditions in the secondary freeze drying machine not above 70°F room temperature. The loss of virus after primary freeze drying of vaccine was negligible. The titre varied from $10^{8.66}$ to $10^{8.17}$. The highest loss of virus was found when necking was done in glass ampoules on Oxy-acetelene flame in room temperature above 70°F. The titre varied from $10^{8.17}$ to $10^{5.84}$. Such loss of virus could be minimized if room temperature could be maintained below 70°F.

Vet. Sci. 77 Hyder, G. 1973. **Improved Haemorrhagic septicaemia vaccine.** *Seminar Ani. Res. Inst. Comilla.*

Four batches of alum precipitated H.S. Vaccine were prepared according to the methods of Bain with aerated culture grown in two types of media, with or without casein acid and with acid digest of ox pancreas and bactopectone. There was no physical difference in growth in these two media. Alum precipitated vaccines were inoculated in animals in 2, 5 and 10 c.c. doses. Some animals receiving 2 c.c. and 10 c.c. doses reacted severely even showing the symptom of temporary shock. The stocking substance was later detected in the supernatant fluid. In the next experiment the supernatant fluid was replaced by saline and after inoculation into bull calves was found to be absolutely free from shock and other side reactions. The alum precipitated vaccine was able to confer active immunity which lasted up to 10 months. Animals vaccinated with oil adjuvant and alhydrogel absorbed vaccine at 5 c.c. dose were found to be free from systemic reaction. Immunity produced by both the vaccines lasted up to 19 months tested so far.

Vet. Sci. 78 Hyder, G. 1973. **Enterotoxaemia or pulpy kidney disease vaccine.** *Indian Vet. J. 50 : (10).*

Enterotoxaemia vaccines were prepared and tested for their relative efficacies by assaying the antitoxin level in the sera of vaccinated subjects. Three different types of culture media were used for preparation of the vaccine, i.e. (a) Papain Digest of beef (b) Papain Digest of beef with meat particles and (c) Synthetic media. An antigenic strain of *Cl. welchii* type D maintained in the Glaxo-Research Laboratory, Greenford England, was used as seed. From each of the above mentioned media three types of vaccines, e.g. alum precipitated bacterin; alum precipitated toxoid and purified toxoid which was absorbed in aluminium hydroxide gel were prepared. Each vaccine was injected into three rabbits and the vaccination was repeated

2 weeks after the 1st-shot. Two weeks after the 2nd vaccination the rabbits were bled and their pooled sera were tested for epsilon antitoxin contents. The minimum antitoxin titre was 4 epsilon unit per ml and the maximum antitoxin titre was greater than 20 epsilon unit per ml. The titre of the antitoxin contents were suggestive of solid immunity in the vaccinated animals.

Vet. Sci. 79 Quader, M. A. and G. Hyder. 1973. **Haemorrhagic septicaemia oil adjuvant vaccine.** *Indian Vet. J. (MS)*.

Haemorrhagic Septicaemia Oil adjuvant vaccine was prepared by mixing 15 parts of alum precipitated broth bacterin of opacity 10 (Brown's) and 10 parts "shell on dina 17" oil or liquid paraffin with 2 parts of lanolin. All blended with an automix blender was tested in 36 animals to find out its efficacy and duration of immunity. Doses of 3 c.c. vaccine was given I/M to each of the test animals. Four vaccinated animals and two controls were employed in each test. As many as 19 animals were used as controls. Five test animal died due to H.S., of these one previously suffered from Foot and Mouth disease. Three out of 19 controls survived. All vaccinated animals of 6, 8, 10, 14 and 18 months groups (duration of immunity) survived the challenge. One test animal of 12 months group and two test animals of 16 months group died of H.S. on challenge. These tests indicated that the immunity produced by the vaccine against the disease would last for at least 18 months. No significant reaction thermal or general was noticed in the test animals.

Parasitology

Vet. Sci. 80 Huq, M. M. 1966. **Differential egg counts (eggs/gm. of faeces) of sheep on high and low protein intake.** *Texas A and M Univ. U. S. A. (MS)*. 20.

Of 32 sheeps 16 were maintained on high (about 18 per cent) and 16 were maintained on low about 14 per cent protein diet. Differential egg counts were made every week from each of the sheep. The egg count data suggested that neither high protein diet nor low protein diet had any influence on the number of ova.

Vet. Sci. 81 Qadir, A. N. M. A. 1966. **Coenurosis in the Indian buffalo (*Bos bubalis*).** *Ceylone Vet. J. 14(4) : 96*.

The object of this paper is to present a case report of infection with *Coenurus cerebralis*, the bladder worm stage of *Taenia multiceps* in a buffalo to the Dairy Farm of East Pakistan Agricultural University, Mymensingh. The clinical signs and symptoms manifested by the animal was discussed.

Vet. Sci. 82 Qadir, A. N. M. A. 1966. **A comparative study of thiabendazole and franten as anthelmintics on the gastro-intestinal parasites of goat.** *Pakistan J. Biol. Agr. Sci.* 9(2) : 29-32.

In this experiment the anthelmintic effect of thiabendazole and franten against the gastro-intestinal nematodes of goat were compared on the basis of pretreatment differential egg per gram counts. Thiabendazole at a dose of 100 mg/kg of body weight was found highly effective in reducing egg counts of trichostrongylid-type of nematodes, slightly effective in reducing *Strongyloides* spp. and not reducing *Trichuris* spp. of eggs in the counts. Franten at a dose of 500 mg/kg of body weight found slightly effective in reducing egg counts of trichostrongylid-type and not reducing *Strongyloides* spp. and *Trichuris* spp. of eggs. There was no significant difference between egg counts at the beginning and at the end of the experiment in the control group.

Vet. Sci. 83 Huq, M. M. 1967. **Efficacy of organophosphorus compounds in the treatment of demodectic mange in dogs.** *M. Sc. Thesis. Texas A and M Univ. U. S. A. (MS).* 42 p.

Twelve dogs having demodectic mange were equally divided into four groups. The dogs of the first group were treated interamuscularly with Tiguvon at the rate of 18 mg/kg. once a week for 17 weeks. The second group of animals was treated with a wash of a five per cent concentration of 4.072 once a week for ten weeks. The Third group of dogs was treated by scrubbing the lesions with a two per cent solution of korlan once a week for 11 weeks. In this experiment two per cent solution of Korlan applied as a wash apparently was in effective treatment.

Vet. Sci. 84 Qadir, A. N. M. A. 1967. **A comparative study of thiabendazole and phenothiazine as anthelmintics for the gastro-intestinal nematodes of goat.** *Ceylone Vet. J.* 15(1): 14-17.

In this experiment anthelmintic effects of thiabendazole and and phenothiazine against the gastro-intestinal nematodes of goats were studied on the basis of egg per gram counts and total worm counts. Thiabendazole at a dose of 100 mg/kg was found highly effective to kill or expel out large number of genera of the gastrointestinal nematodes of goats. Whereas, phenothiazine was found unable to kill or expel a significant number of parasites from the gastro-intestinal tract. But the latter effectively inhibited the egg production of the parasites. There as no significant difference in the worm counts at necropsy between the phenothiazine treated group and the control group.

Vet. Sci. 85 Qadir, A. N. M. A. 1967. **Investigation on the incidence of gastro-intestinal parasites of goats in the East Pakistan Agricultural University Campus.** *Ceylone Vet. J.* 15(2) : 58-61.

A survey of the gastro-intestinal parasites of goats slaughtered at the slaughter house at Mymensingh, East Pakistan revealed a high incidence of *Oesophagostomum columbianum*

and *Haemonchus contortus* infections through out the year. Incidence of *Haemonchus*, *Oesophagostomum*, *Strongyloides*, *Trichuris*, *Trichostrongylus*, *Moniezia* species and some rumen flukes of different species were recorded. The average parasite load was very low. No significant seasonal variations in the incidence of *Haemonchus* and *Oesophagostomum* infections were noticed.

Vet. Sci. 86 Hoq, S. and S. Hefazuddin. 1968. **A survey of helminths parasitising the gastro-intestinal tracts of goats and sheep in East Pakistan.** *Pakistan J. Vet. Sci.* 2(2) : 54-62.

A survey of helminths in the gastro-intestinal tract of sheep and goat of Mymensingh was undertaken. 320 viscera were examined and 90% of those were found parasitized. In this survey the following helminths were encountered and described : Nematodes- *Haemonchus contortus*, *Oesophagostomum columbianum*, *Trichostrongylus colubriformis*, *Trichostrongylus axei*, *Strongyloides papillans*, *Trichuris ovis*, *Trichuris globulosa*, *Crongylonema pulchrum*. Cestode- *Moniezia expansa*. Trematodes- *Paramptostomum cervi*, *Cotylophoron cotylophorum*, *Gastrothylax crumenifer*. The incidences of these parasites were also recorded. The incidence of *Oesophagostomum columbianum* and *Haemonichus contortus* infections were found very high. The incidence of parasitic infection due to seasonal variations was recorded.

Vet. Sci. 87 Huq, M. M. 1968. **Hydratidosis in buffalo.** *Pakistan J. Vet. Sci.* 2(3) : 162-164.

Forty eight hydatid cysts having diameter of two to four inches were recorded from one half of the lungs of a female Murrah buffalo. The cysts in other half of the lungs were coalaced and could not be recovered.

Vet. Sci. 88 Huq, M. M. and M. S. Rahman. 1968. **Morphology and incidence of *Homalogaster poloniae*, in cattle of Mymensingh district, East Pakistan.** *Pakistan J. Vet. Sci.* 2(2): 84-89.

One hundred caeca of which 50 during dry season and 50 during rainy season collection from slaughtered cattle of Mymensingh slaughter house, were studied. About 10% and 90% cattle of Mymensingh district during dry and rainy season respectively showed infection with *Homalogaster poloniae*, the caecal trematode. Lesions were circumscribed, raddish, pimple like raised areas and the faeces were sometimes loose, watery, and foamy. Life history is not known but seems to be like that of the amphistomes.

Vet. Sci. 89 Hefazuddin, S. and A. S. M. H. Rahman. 1968. **Studies on the cerceria of digenetic trematodes in the snails *Thiara tuberculata* (Muller).** *Pakistan J. Vet. Sci.* 2(3) : 147-150.

Five hundred fifty ovoviviparous snails *Thiara tuberculata* were examined for possible infection with the cercariae of digenetic trematodes. Of these 222 (40.36%) of the snails were

detected to infected with the larval stages of various species of Trematodes. Four different types of cercariae recovered from the infected snails were pleurolophocercus cercariae in 77%/31%, xiphidiocercariae in 24.77%/10%, Crymnocephalus cercariae in 1.8%/0.7% and Furcocercus cercariae in 0.45%/0/18% of the infected and overall snails. Mixed infections in snails with the larval stages of trematodes were rare.

Vet. Sci. 90 Hefazuddin, S., M. M. Huq, M. S. Rahman, S. Haq, and M. A. Mollah. 1968. **Trial with promintic in the treatment of gnathostomiasis in cat.** *Pakistan J. Vet. Sci.* 2(4) : 200-203.

Promintic was tried on a siamese cat having *Gnathostoma spinigerum* infection. A total of three injections, each consisting of 0.5 ml. of Promintic, were injected subcutaneously. Second injection was given at an interval of one month after the first and the third one after 17 days of the second injection. The faeces become negative for ova on the 14th day after 1st injection and continued for nine days. After the second injection the faeces was negative for ova on the 18th day whence the 3rd dose was injected and the faeces continued to be negative for a month. In this trial Promintic seemed to have some effect-against the production of *Gnathostoma spinigerum*.

Vet. Sci. 91 Ahmed, S. 1969. **Survey on type helminths commonly found in country ducks.** *Pakistan J. Vet. Sci.* 3(3) : 110-112.

A survey of helminthic infection in the country ducks of Comilla was undertaken. Two hundred ducks were examined on different dates and 67% of the elementary tracts were found helminth infested. During this survey, *Hymenolepis lanciolata* and *Echinostoma - revolutum* were encountered.

Vet. Sci. 92 Huq, M. M. and A. U. Mollah. 1969. **A survey on the prevalence of lice on sheep and goats of Dacca and Mymensingh, East Pakistan.** *pvj* 6(1-4) : 21-25.

In an investigation on the prevalence of lice on sheep and goats of Dacca and Mymensingh districts, 84 sheep and 178 goats were examined. 40.47% sheep and 36.20% goats were found to be infested with different species of lice. During this study *Damalinia ovis* on sheep, and *Linognathus africanus* and *Damalinia caprae* on goats had been collected. The incidence of infestations of sheep and goats with lice was gradually increasing from early winter till early spring and rapidly decreasing from May till August. There was not significant difference between the infestation of both adult and young animals.

Vet. Sci. 93 Huq, M. M. 1969. **A survey of the helminth parasite of roof rats, *Rattus rattus*, Digger rats, *Bandicota bengalensis*, and mole, *Scalopus scapanus* in Mymensingh district, East Pakistan.** *Pakistan J. Vet. Sci.* 3(2): 65-58.

Two hundred rats belonging to three species caught from the East Pakistan Agricultural University Campus and Mymensingh town area were examined for helminth parasites. Heart, lungs, liver, diaphragm, kidneys, urinary bladder and the digestive tracts were examined for

the presence of helminths. The intestinal tracts only were found to harbor the different types of helminth parasites. Of the two hundred rats 80% harbored *Hymenolepis diminuta*, 90% harbored *Nippostrongylus muris*, 50% harbored *Trichuris muris*, 20% harbored *Trichinella spiralis*, 10% harbored *Physaloptera* spp. 95. 25% harbored *Cyclodonostomum purvisi*, and 20% harbored *Moniliformis moniliformis*.

Vet. Sci. 94 Qadir, A. N. M. A. 1969. **Study to determine the utility and the limitation of egg per gram count in the estimation of gastro-intestinal nematode population.** *Dept. of Parasitology Res. Rep. (MS)*.

The object of this study was to develop a critical clinical diagnostic method for the diagnosis of parasitic infections in livestock by determining the average worm load with different nematodes. Such information would help in the effective and economic treatment against parasitic infections. In order to obtain an estimation of the relative numbers of different gastro-intestinal nematode parasites of animal, an attempt was made to correlate differential egg per gram counts with the relative worm counts at necropsy in different host-parasite systems. Webster mice was artificially infected with *Nematospiroides dubius* to contribute to an understanding of natural behaviour with respect to egg-laying phenomenon of trichostrongylid group of nematodes. Three other experiments were conducted with the naturally infected sheep and goats to contribute to an understanding of egg to worm relation of the trichostrongylid nematodes. The correlation between worm egg counts and adult worm population was found highly insignificant. It has been suggested that the quantitative determination of worm burden by faecal egg per gram counts might be of practical value if other information like grazing history, intensity of pasture infestation by infective larvae, fecundity of the different groups of nematodes and clinical symptoms are incorporated for interpretation of egg counts in determining the approximate worm load of herd animals.

Vet. Sci. 95 Rahman, M. S. and S. Hefazuddin. 1969. **Efficacy of copper sulphate and potassium permanganate as anthelmintics in the treatment of ascaridia galli (Schrunk, 1788) infection in chickens.** *Pakistan J. Vet. Sci. 3(3) : 119-126*.

Forty five birds aged about 4 weeks were administered each with 500 infective ova of *Ascaridia galli* orally. Three birds were sacrificed to detect the infectivity of the ova. Twelve birds died due to primary parasitosis. The remaining 30 birds were divided into 5 groups. One group was used as control and the other 4 groups were treated as such-Group-1, received 1% copper sulphate; group-2, received 0.1% copper sulphate; group-3, received 0.1% potassium permanganate; group-4, received a mixture of equal quantities (v/v) of 1% copper sulphate and 0.01% potassium permanganate in drinking water for 3 consecutive days. On autopsy after 32 days of administration the drugs were found to be 62.4%, 31.02%, 43.3% and 80% effective against *Ascaridia galli* respectively. No ill-effects of toxic symptoms were observed after treatment and the drugs were well tolerated upto the concentration, 1% copper sulphate and 0.1% potassium permanganate.

Vet. Sci. 96 Razzak, A. and S. Hefazuddin. 1969. **A survey on the prevalence of ticks on cattle in East Pakistan.** *Pakistan J. Vet. Sci.* 3(2) : 54-60.

A survey on the prevalence of ticks on cattle in some districts of East Pakistan was undertaken from 1967 to 1971. Out of 70 cattle examined 264 (33.4%) were found to be infested with different types of ticks. *Boophilus microplus*, *Haemaphysalis bispinosa* and an unidentified species of the genus *Hyalomma* had been encountered. The rates of infestation in cattle of Comilla, Chittagong, Dacca, Mymensingh and Rajshahi districts were 46.4, 25.0, 31.6, 38.3 and 21.6, 16.0, 15.3, 36.9 and 14.3 per cent in young animals respectively with *Boophilus microplus*; 10.7, 20.0, 0.4, 6.6 and 5.0 per cent in adult animals and 8.1, 0.0, 1.3, 4.6 and per cent in young animals respectively with *Haemaphysalis bispinosa*; with species of *Hyalomma* 13.3% in adult and 20.0% in young animals of Rajshahi districts only. In these districts 41.54, 31.1, 26.5, 43.78 and 38.95 per cent of cattle were infested with different types of ticks. This survey revealed that the infestation of adult cattle was higher than that of young stock and the incidence increased in summer whereas gradually decreased from rainy season to winter.

Vet. Sci. 97 Abedin, J. and M. M. Huq. 1970. **Mallophaga I. of Domesticated fowls (*Gallus gallus*) in East Pakistan.** *M. Sc. (Vet. Sci.) Thesis. East Pakistan Agr. Univ. (MS).*

In an investigation of lice infesting domesticating fowls of East Pakistan a total of 5934 fowls were examined, of which 70.32% were found to be invested with one or more of the following species. Mallophaga encountered in this investigation are *Gonoides dissimilis*, *Goniocotes gallinae*, *Lipeurus caponis*, *L. lowrensis tropicalis*, *Menopon gallinae*, *Menacanthus pallidulus*, *M. stramineus*. They were maximum during January to March.

Vet. Sci. 98 Huq, M. M. and J. Abedin. 1970. **Mallophaga II. of Domesticated ducks (*Anas boschas domestica*) in East Pakistan.** *M. Sc. (Vet. Sci.) Thesis. East Pakistan Agr. Univ. (MS).*

In an investigation of lice infesting domesticated ducks of East Pakistan a total 1030 ducks were examined, of which 61.65% were infested with one or more of the following species. Mallophaga encountered in this investigation are : *Anaticola crassicornis*, *Anatoecus icterodes*, *Holomenopon spp.*, *Goniocotes dissimillis*, *Lipeurus caponis L.*, *Lowerensis tropicalis* and *Menopan gallinae*.

Vet. Sci. 99 Mollah, M. A., M. M. Huq, and S. Hefazuddin. 1970. **A survey on the prevalence of lice of cattle and buffaloes of Dacca and Mymensingh district, East Pakistan.** *Bangladesh Vet. J.* 4(1-4) : 3-9.

In an investigation on the prevalence of lice of domestic cattle and buffaloes of Dacca and Mymensingh districts a total of 572 animals were examined. Out of these 402 were cattle and 170 were buffaloes. In this investigation 23.38% cattle and 33.50% buffaloes were found to be infested with different species of lice. In the course of this study *Linognathus vituli*,

Haematopinus quadripertusus, *H. eurysternus* and *Haematopinus tuberculatus* on buffaloes had been recorded. The incidence of cattle and buffaloes was gradually increasing from early winter till early spring and rapidly decreasing from May to August.

Vet. Sci. 100 Qadir, A. N. M. A. 1970. **Whipeworm infection in cattle, sheep and goats at the East Pakistan Agricultural University Campus.** *Dept. of Parasitology, Res. Rep. (MS).*

The object of this paper was to present some observation on the prevalence and effect of *Trichuris* infection in local ruminants. Two hundred and thirty five, that is 18.1 per cent of 1298 goat viscera examined were found infested with *Trichuris* species. The numbers of *Trichuris* worms ranged from 1-33 with an average of 7 worms per viscera. Twenty four that, is 22.43 per cent, of 107 calf viscera examined were found infected with *Trichuris* spp. Forteen, that is 24.6 per cent of 57 sheep viscera examined were found infected with *Trichuris* spp. Few calves showed clinical symptoms like persistant diarrhoea, emaciation and pot-bellied appearance and which were considered to be attributed by *Trichuris* infestation. Sheep and goats did not show any clinical symptoms.

Vet. Sci. 101 Qadir, A. N. M. A. 1971. **Chemical control of the free-living stages of ruminant nematodes. I. Larvicidal action of some chemical compounds.** *Ceylone Vet. J. 19(1-2) : 4-5.*

In this experiment larvicidal actions of some chemical compound were studied. The effects of 22 chemical compounds on the development of the free-living stages of common gastrointestinal nematodes were tested. Sodium salicylate, acetic acid, oxalic acid, nicotinic acid, picric acid, lithium carbonate, sevidol and phenovis were 100 per cent effective in preventing the development of eggs to infective larvae at a concentration of 0.1 per cent. Urea completely inhibited the development of larvae at a concentration of 1.0 per cent. From the economic point of view urea has been recommended for field treatment.

Vet. Sci. 102 Qadir, A. N. M. A. 1971. **Chemical control of the free-living stages of ruminant nematodes. II. Larvicidal action of selected chemical compounds on infective larvae.** *Dept. of Parasitology, Res. Rep. (MS).*

In this experiment larvicidal actions of four chemical compounds, common salt, copper sulphate, urea and boric acid were tested on one square foot outdoor experimental plots. The plots were artificially infested with a water suspension of 10,000 infective larvae. The plots were treated with different compounds at the rate of 5 pounds per hundred square feet surface area. Ten days following treatment larvae were recovered from the plots. Urea was found most effective of the compounds tested that killed 72.66 per cent of the infective larvae in the plot. Common salt, copper sulphate and boric acid killed 43.02, 20.07 and 62.79 per cent of the larvae respectively.

Vet. Sci. 103 Qadir, A. N. M. A. 1971. **Chemical control of the free-living stages of ruminant nematodes. II. Pasture treatment with urea for control of parasitic nematodes.** *Dept. of Parasitology, Res. Rep. (MS).*

In this experiment possibility of the use of urea as larvicides against the free-living stages of parasitic nematodes under pasture condition was studied. Two pasture plots each of 400 sq. Ft. area were artificially infested with large number of eggs of the gastro-intestinal nematodes of cattle and goats. One of the plots was treated with 20 pounds of urea (at the rate of 5 pounds per 100 sq. ft.). Ten days following treatment parasite free animals were allowed to graze in those plots. Animals were withdrawn from the plots 10 days following their release and maintained inside the house for total worm counts. Calves and goats grazed on treated plot showed 58.9 and 82.4 per cent reduction respectively in the total worm count in comparison to animals grazed on untreated plot. Urea appears to have considerable effects in lowering the level of pasture infestation by the parasitic nematodes significantly. It is presumed that periodical use of urea in the pasture along with strategic treatment of livestock should assist in bringing about an adequate control of the gastro-intestinal nematode parasitism in ruminants.

Vet. Sci. 104 Rahman, M. H., K. N. Soliman, and S. Hefazuddin. 1971. **Helminth parasites encountered in the abomasum of ruminants of East Pakistan.** *Proc. Pakistan Sci. Conf. Univ. Peshwar. 17-18.*

Abomasi of ruminants were collected from the slaughter houses of the districts of Dacca, Mymensingh, Comilla and Chittagong, Chittagong Hill Tracts, Jessore, Khulna and Rajshahi, so as to know the representative parasitic fauna of ruminants of East Pakistan. 420 abomasi (cattle 200, goats 150 and sheep 70) were examined from the period May 1967 to August 1969. The percentages recorded showed that large number of cattle (87.5%) were infested with the harmful helminths. A great majority of the animals were infested with more than one pathogenic species. Parasitic species inhabiting the abomasum of cattle were *Mecistocirrus digitatus*, *Haemonchus contortus*, *Haemonchus similis*, *Trichostrongylus axei*, *Cooperia punctata*, *Cooperia pectinata*, *Capillaria bilobata*, *Bunsostomum bovis*, *Ostertagia trifurcata*, and immature stages of *Gastrothylax* and *Cotylophoron* species. Species of parasites recorded from the abomasi of sheep and goats were *Haemonchus contortus*, *Trichostrongylus axei*, *Trichostrongylus colubriformis* and immature *Gastrothylax* and *Cotylophoron* species.

Vet. Sci. 105 Rahman, M. H., K. N. Soliman, and S. Hefazuddin. 1971. **A preliminary study on the occurrence of *Linguatula serrata* in street dogs of Bangladesh.** *Bangladesh Vet. J. 5(1-4) : 65-67.*

An investigation was made on the street dogs to determine the incidence of *Linguatula serrata* in Bangladesh. Seventy five dogs from different districts of Bangladesh were examined. Dogs were collected from both human habitats and slaughter house areas. Forty three per cent dogs were found infested. The rate of incidence was recorded higher amongst the dogs from slaughter house areas (49%), whereas the incidence was comparatively low

among the dogs from human habitats (14%). The cause of high incidence among the dogs from slaughter house areas was due to the free access to the discarded mesenteric lymph nodes of cattle and goats containing immature *Linguatula*.

Vet. Sci. 106 Rahman, M. H. and K. N. Soliman. 1972. **Helminth parasites of street dogs in some districts of Bangladesh.** *Bangladesh Vet. J. (MS)*.

A survey was conducted to determine the helminth parasites of street dogs in Bangladesh. Sixty dogs from the districts of Dacca, Rajshahi, Mymensingh, Comilla and Chittagong were examined for this purpose. Thorough investigation of the digestive tracts of these dogs revealed the occurrence of five species of nematodes, five species of cestodes and three species of trematodes. All the dogs were found to be infected with one or more species of helminths constituting hundred per cent infection. Percentages of infections with the helminths were recorded as such : *Spirocerca lupi* (63.3%), *Gnathostoma spinigerum* (40%), *Ancylostoma caninum* (100%), *Trichuris vulpis* (13.3%), *Toxocara canis* (23.3%), *Taenia multiceps* (56.6%), *Taenia hydatigena* (20%), *Echinococcus granulosus* (13.3%), *Dipylidium caninum* (16.6%), *Diphyllbothrium latum* (13.3%), *Opisthorchis felineus* (11.6%), *Opisthorchis sinensis* (1.6%) and *Echinochasmus* spp. (1.6%).

Vet. Sci. 107 Kader, S. A. and M. M. Huq. 1973. **A study on the prevalence of ticks of sheep and goats in Comilla Kotwali Police Station, Bangladesh.** *M. Sc. (Vet. Sci.) Thesis. Bangladesh Agr. Univ. (MS)*.

Comilla Kotwali police station was divided into Hilly and Plane Zones for investigation of ticks, parasitizing sheep and goats. Out of 321 sheep and 522 goats 62.30% sheep and 76.62% goats were infested with *Haemaphysalis bispinosa* and *Boophilus microplus*. 79.76% and 56.11% sheep and 91.76%, 69.31% goats were infested with different types of ticks in hilly and plane zones respectively. The rates of infestations in sheep of hilly and plane zones were 77.38% and 57.80% with *Haemaphysalis bispinosa*, and 39.28% and 6.32% with *Boophilus microplus* respectively. The rates of infestations in goats of hilly and plane zones were 88.23% and 71.30% with *Haemaphysalis bispinosa* and 6.47%, 4.26% with *Boophilus microplus* respectively. The incidence of infestations of ticks on both sheep and goats increased in summer and gradually decreased from monsoon to winter. Incidence of infestations with ticks was higher in female of both animals than in male. *Haemaphysalis bispinosa* was wide spread on sheep and goats and *Boophilus microplus* was less in these animals. There was a significant difference in the rate of infestation amongst adult and young goats but the difference among seasons was not significant. A significant difference in the rate of infestation of ticks on sheep in different seasons was observed but the difference between ages was not significant.

Vet. Sci. 108 Rahman, H. M. and A. Razzak. 1973. **Incidence of helminth parasites infecting the cattle in the Kotwali Thana of Comilla.** *Bangladesh Vet. J. (MS)*.

The cattle population under consideration were distributed in the villages adjacent to the eastern and southern part of Comilla town. Cattle include in this survey were one month old calves to adults of either sexes and from apparently healthy to emaciated animals. Topographical conditions were same in all the villages. The level of nutrition was poor and methods of husbandry were orthodox. Faecal samples from 838 cattle were examined from the period; March, 1970 to February, 1971. Faecal samples of 813 cattle were positive with one or more helminth constituting 97% per cent infection. Percentages of infection with different genera and species of prevailing helminths were as follows : *Paramphistomum* spp. (62.6%), *Fasciola gigantica* (16.3%), *Schistosoma indicum* (1%), *Neoscaris vitulorum* (0.9%), *Trichuris* spp. (8.8%), *Strongyloides* spp. (3%), and Strongylids (36.7%). Seasonal incidence of the helminths were studied. The rise of incidence during monsoon and winter in case of *Strongyloides* infection has been explained due to the favourable condition for the preparasitic stages during monsoon and maturation of latent infection due to cold stress during winter. Steady rise of infection during monsoon in case of *Paramphistomum* spp. and *Fasciola gigantica* infection has been explained due to ingestion of metacercariae from grasses of the marshy lands during winter and early spring. On the basis of this explanation strategic methods of treatments were followed with resultant improvement in health and productivity of the treated animals. Tactical treatments were followed in case of infection with other helminths with significant outcome.

Pathology

Vet. Sci. 109 Shah, M. A. and C. S. Ali. 1969. **Blood grouping in buffaloes and its importance in blood transfusion.** *Pakistan J. Vet. Sci.* 3(3) : 113-118.

Blood from 150 buffaloes was examined for antigen antibody reactions. R.B.C. and sera were reacted in every possible combination and a total of 1490 combinations were examined. Based on the results of iso-agglutination tests the presence of at least eight blood groups in buffaloes were detected. There were four antigens and five antibodies present in the red cells and sera of the buffaloes respectively. The final blood grouping by percentage was : Group A = 0.7; B = 1.33; C = 0.7; D = 2.0; E = 37.33; F = 20.67; G = 28.67 and O = 8.67.

Vet. Sci. 110 Soliman, K. N., M. L. Dewan, and M. U. A. Choudhury. 1969. **Pathology of glanders occurring in Dacca.** *Pakistan J. Vet. Sci.* 3(2) : 80-85.

Glanders was detected in 3 race horses of Dacca city. Pathological changes were typical. This report is intended to draw the attention of veterinary and public health departments of the prevalence of the disease.

Vet. Sci. 111 Moslehuddin, M. L. Dewan and K. A. Choudhury. 1972. **Avian leukosis in Mymensingh district.** *Bangladesh Vet. J.* 6(1-4) : 39-42.

The incidence of lymphoid leukosis in the district of Mymensingh was studied. Out of the 1626 birds examined 76 and 1550 were of exotic and indigenous birds respectively. Of the 76 exotic birds 12 birds were found to be positive for visceral lymphometosis and the age of the affected birds ranged from 1-3 years. The female was found to be more susceptible than the male. The local indigenous birds seemed to be resistant to the disease. None of the 1550 indigenous birds were affected with lymphomatosis. The cause of this natural resistance was not immediately known and this necessitates further work. Whether repeated exposure of the indigenous birds to the virus of lymphometosis or the effect of cross breeding between the local and the imported birds, would in future, break this resistance, is to be watched.

Pharmacology

Vet. Sci. 112 Ahmad, A. 1967. **Determination of manganese and copper in rat liver cell fractions by activation analysis.** *Pakistan J. Vet. Sci.* 1(1) : 11-15.

Determination of Mn and Cu in rat liver cell fractions has been made by activation analysis technique. Mn and Cu were found only in the mitochondrial fraction, their average concentrations being 8.22 µg/g and 56 µg/g respectively. These elements are most probably present in the mitochondria as inseparable part of enzyme complex perhaps in the form of a metalloprotein as they were not removed on prolonged dialysis against decaerized water.

Vet. Sci. 113 Ahmed, S. 1967. **Observation on the use of pipricide as an anthelmintic in local fowls.** *Pakistan J. Vet. Sci.* 1(3) : 70-72.

Pipricide, worm powder of Burroughs Wellcome, was tried in 15 fowls infested with *Ascaridia*, *Helirakis* and *Capillaria* and administered as single or double dose at the rate of 300 mg. Per bird and found to be very effective and free from toxic effects.

Vet. Sci. 114 Khan, M. A. I. 1969. **Action of combined analeptics for counteracting acute barbiturate intoxication in the dog.** *Pakistan J. Vet. Sci.* 3(3) : 91-96.

The combination of methetharimide and methyl phenidate were used to observe the changes in ventilation blood pressure and the awakening properties in deeply anesthetized dog with pentobarbital sodium. The effects of the combination were observed in the following order : (a) methetharimide 40 mg/kg I.V. and Methylphenidate 6 injections of 5 mg/kg each I.V. at 20 minute intervals revealed the maximum average percentage increase in ventilation by 460 per cent. (b) Methetharimide of 20 mg/kg I.V. and Methylphenidate 6 injections of 5 mg/kg each I.V. at 20 minutes intervals revealed the maximum average percentage increased in ventilation by 197.18 per cent. (c) The maximum average increased in ventilation deeply anesthetized dogs with no analeptics was 25 per cent. There was no remarkable change in blood pressure in any combination of the drugs used.

Vet. Sci. 118 Wahab, A., A. Ahmed, and S. U. Ahmed. 1969. **Extraction of alkaloid and their detection from *Adhatoda vasica* Nees.** *Pakistan J. Vet. Sci.* 3(4) : 178-184.

Adhatoda vasica Nees was extracted for alkaloids by "Aliquot Method". The presence of alkaloid was detected and confirmed by precipitation, spot, and chromatographic tests. From the chromatographic study it appeared that the plant *Adhatoda visica* Nees contains not one but more than one alkaloids. This appears to be first report on the presence of a few alkaloid in this plant.

Vet. Sci. 119 Sobhan, M. A., A. Ahmed, and S.U. Ahmed. 1970. **Quantitative determination of hydrocyanic acid in some plants of Mymensingh district.** *Bangladesh Vet. J.* 4(1-4) : 10-13.

Plant cyanide was estimated quantitatively on fourteen known cyanogenetic plants. Out of these 14 plants, linseeds, leaves of *Prunus persica* and growing shoots of bamboo contained cyanide 0.063, 0.0442 and 0.0365 per cent respectively. These three plants may act as a potential source of danger to the livestock of eaten sufficient amount at a time. Rest of the plants contained variable amount of cyanide from traces to 0.0186 per cent. The other 11 plants did not appear to be harmful to the livestock.

Vet. Sci. 120 Akanda, M. Q. A., M. A. I. Khan, and S. U. Ahmed. 1972. **Pharmacological study of the alkaloid (s) from Haritaki (*Terminalia chebula* Retz).** *Bangladesh Vet. J.* 6(1-4): 3-7.

The ripe dry fruits of Haritaki (*Terminalia chebula* Retz.) was extracted as per "Aliquot method". Precipitation test, spot test and ascending paper chromatographic techniques confirmed the presence of alkaloid (s) in the total extract. The effect of the alkaloid on blood pressure was studied in anaesthetised dog. Administration of total extract produced considerable rise in blood pressure. The hypertensive property of the total extract may have therapeutic application in cardiac disease.

Physiology

Vet. Sci. 121 Ahmed, S. U. 1966. **Hormonal control of reproductive activity in the ewe.** *Pakistan J. Vet. Sci.* 2(2) : 47-53.

Sixteen lactating ewes ranging in age from 3 to 6 years were used and grouped into two equal groups. Progesterone was administered to each of 8 ewes subcutaneously for 10 days starting on the 19th day after parturition; estrogen was injected intramuscularly on the 29th day after parturition. The intramuscular injection of estrogen and subcutaneous injection of PMS were administered on the 30th day after parturition. None of the ewes exhibited estrus during the progesterone treatment. All of the ewes showed estrus within 24 hours of the estrogen injection. This indicated that exogenous as well as indigenous source of estrogen induced estrus in lactating ewes. *Corpora lutea* and follicles of various sizes were observed at

operation. Histological examination exhibited some active luteal cells but the majority were regressing. The other eight ewes used as control group revealed no evidence of estrus.

Vet. Sci. 122 Ahmed, A. 1967. **Cottonseed meal and gossypol toxicity in domestic animal.** *Pakistan J. Vet. Sci. 1(2) : 17-21.*

The author made an up-to-date review of the literature on the subject. The author observed the effect of ferrous sulphate and of fish meal and/or meat scrap on gossypol toxicity in pigs. It is found that addition of ferrous sulphate in the diet of pig receiving 10% cotton seed meal prevented the toxic effect of gossypol and reduced the gossypol contents of the liver by nearly half. Fish and meat scraps were not half as effective as ferrous sulphate in binding gossypol and blocking its toxicity.

Vet. Sci. 123 Ahmed, M. and W. M. Dickson. 1967. **Immunological investigations of pituitary follicle stimulating hormones.** *Pakistan J. Vet. Sci. 1(4) : 111-119.*

Rabbits were immunized against ovine or porcine pituitary stimulating hormone (FSH). The resulting antisera were used to study the immunochemical behaviour of purified pituitary ovine, porcine and partially purified bovine, porcine and partially purified bovine FSH preparations. Ovine FSH (NIH-FSH-53) and porcine FSH (Armour & Co.-PFSH), when reacted with their respective antisera in double gel diffusion studies, immunoelectrophoresis and quantitative precipitation reactions were found to be heterogenous compounds. A cross reaction was observed between porcine and ovine FSH preparations against rabbit antiserum to porcine FSH but not with antiovine FSH serum by any of these procedures. Partially purified bovine FSH reacted both with antisera against ovine and porcine FSH in gel precipitation test. Ovine and porcine FSH was labelled with ^{131}I to develop a radio immunoassay for the detection of blood FSH concentrations. The labelled FSH preparations showed heterogenous behaviour of paper chromatoelectrophoresis.

Vet. Sci. 124 Ahmed, S. U. 1967. **The combined effects of adrenalectomy and radiation on albino rats.** *Pakistan J. Vet. Sci. 1(1) : 1-4.*

Thirty male albino rats were grouped at random into three equal groups : (a) bilateral adrenalectomy (b) unilateral adrenalectomy and (c) control). Five animals of each group were exposed to single dose of gamma radiation of 600 for 1 hour from Co^{60} source. Life span was comparatively shortened in bilaterally adrenalectomized irradiated animals as compared to unilaterally adrenalectomized irradiated ones. Bilaterally adrenaectomized irradiated animals did not respond to exogenous hormonal treatment. Gross and microscopic changes were observed in liver, heart, kidney, spleen, lungs, stomach, intestines and testes of all irradiated animals.

Vet. Sci. 125 Ahmed, S. U. 1967. **Effects of heat stress on oxygen consumption in laboratory animal.** *Pakistan J. Vet. Sci.* 1(4) : 125-128.

An experiment was conducted to investigate the effect of heat stress on oxygen consumption. 40 male albino rats were assigned to two treatment groups : (a) heat stress and (b) control. Group (a) was exposed to heat stress at temperature of $93^{\circ}\text{F} + 2.2^{\circ}\text{F}$ in the heat chamber. Group (b) was kept in control chamber maintained at $78^{\circ}\text{F} + 2.6^{\circ}\text{F}$. Oxygen consumption was taken once a week from each group of animals. Steady but non-significant increase in oxygen consumption was found during the first 20 days of heat stress. There after oxygen consumption continued to decrease throughout the entire stress period whereas significant decrease in oxygen consumption was observed on the 48th day heat stress.

Vet. Sci. 126 Ahmed, S. U. 1967. **Hematological study of irradiated and heat stressed albino rats.** *Pakistan J. Vet. Sci.* 1(2) : 9-13.

Eighty male albino rats were assigned at random to each two treatment groups : (a) continuously irradiated and (b) control. Group (a) was subjected to gamma irradiation from Co^{60} source for 50 days to receive a total accumulated dose of 1000 r at the rate of 20 r per day. At the end of irradiation, 20 animals of each group were moved to heat chamber maintained at $93^{\circ}\text{F} + 2.2^{\circ}\text{F}$ temperature and $88 + 4$ per cent humidity. The remaining half of each group was kept in control chamber maintained at $78^{\circ}\text{F} + 2.6^{\circ}\text{F}$ temperature and $28 + 13\%$ humidity. At the end of the heatstress the blood samples were taken from each individual animals. Hemoglobin concentration showed a significant decrease in all groups as compared to nonirradiated control. An apparent decrease in hematocrit values, red blood cells counts and neutrophils in leucocytes was noted in irradiated and heucocytes was noted in irradiated and non-irradiated heat-stressed animals as compared to their controls.

Vet. Sci. 127 Ahmed, S. U. 1967. **Effects of heat stress and humidity of body temperature in albino rats.** *Pakistan J. Vet. Sci.* 1(3) : 66-67.

A study was conducted to investigate the effect of heat stress and humidity on the body temperature. 40 humidity on the body temperature. 40 albino male rats were assigned to groups (a) heat stress and (b) control. Group (a) was subjected to heat stress at temperature of $93^{\circ}\text{F} + 2.2^{\circ}\text{F}$ and humidity of $88 + 4\%$. Group (b) was kept in control chamber maintained to $78^{\circ}\text{F} + 2.6^{\circ}\text{F}$ temperature and $28 + 10\%$ humidity. The rectal temperature was taken once a week from each group of animals. The gradual but non-significant increase in body temperature was observed during the first 14 days experiment, whereas significant increase in body temperature was noted during the rest of the period.

Vet. Sci. 128 Ahmed, S. U. 1968. **The induction of breeding activity in lactating ewes during anestrus by the use of pregnant mare serum.** *Pakistan J. Vet. Sci.* 2(1) : 16-23.

Sixteen lactating ewes ranging in age from 3 to 6 years used in this study were grouped into two equal groups. Pregnant mare serum (PMS) at the rate of 1000 I.U. was given

subcutaneously on the 8th day and then on the 20th day after parturition to each of the eight ewes. The ewes did not respond to the 1st injection of PMS. Seven out of eight ewes exhibited estrus following 2nd injection. Average length of time between lambing and estrus is 27.4 days. *Corpora lutea* and small, medium, and large sized follicles were found in ewes at the time of caparotomy. Histological study showed some functional luteal cells and regressing luteal cells. The other 8 ewes kept as control received no experimental treatment and only one of the control group exhibited estrus.

Vet. Sci. 129 Ahmed, S. U. and S. O. Brown. 1968. **Whole body irradiation and tumor formation.** *Pakistan J. Vet. Sci.* 2(4) : 204-207.

One hundred twenty albino rats of Sprague-Dawley strain of 70 days old weighing 260 to 300 gms were used to investigate the effects of ionizing radiation on tumor formation. The animals were assigned to 3 treatment groups consisting of 40 animals in each group. Fractionally irradiated group received a total accumulated dose of 1000 r in 100 days at the rate of 20 r per day over a 20 hour period on alternate weeks. Continuously irradiated group was subjected to irradiation continuously for 50 days to receive a total accumulated dose of 1000 r at the rate of 20 per day. Non-irradiated group served as control. The mean rate of gain in continuously irradiated animals was less as compared to fractionally irradiated groups and significantly less (P<0.01) than control animals. A small tumor was found on the ventral surface of testis of one number of fractionated irradiated group. A small tumor was also noticed on the abdominal region in one of the continuously irradiated animals.

Vet. Sci. 130 Ahmad, A., S. U. Ahmed, and M. a. Maleque. 1968. **Some hematological values for the Pabna cattle.** *Pakistan J. Vet. Sci.* 2(1) : 41-44.

Twenty four indigenous Pabna cows of the E.P.A.U. Dairy Farm were used for studying hematological values. The average findings were RBC-6.09 millions/ cu.mm., Hemoglobin-9.95 per cent, MCV-72.37 cu. Microns, MCH-20.45 mg., MCHC-28.9%, Neutrophils 26.7%, Lymphocytes 60.4%, Monocytes 3.2%, Eosinophils 9.0%, Basophils-0.7%.

Vet. Sci. 131 Beg, M. S. H., A. W. Qureshi, and M. Ahmad. 1968. **Screening of lucerne (*Medicago sativa* L.) for oestrogenic activity.** *Pakistan J. Vet. Sci.* 2(3) : 119-125.

The chemical extraction of lucerne oestrogens was performed to assay their oestrogenic activity. Estimate of oestrogenic potency was done by 4-point bioassay methods using the uterine weight response to two doses diethyl stilboestrol and two doses of lucerne hay extract (3 & 5 gm.). The oestrogenic potency was estimated to be 0.0025 kg/gm of lucerne hay with the fiducial limits of 0.000692 and 0.000453 kg. The injection of 1 gm lucerne extract per day per mouse, 5 day prior to and through gestation period, was found to be insufficient to produce a significant effect upon litter size.

Vet. Sci. 132 Hossain, A. S. K. E. and A. Ahmad. 1968. **Hematological values for the normal buffaloes in the EPAU Dairy Farm.** *Pakistan J. Vet. Sci.* 2(3) : 126-133.

The blood of two breeds of sixty one Murrah and Monipuri buffaloes (fifty four and seven respectively) of EPAU Dairy Farm were studied for the different hematological values. The data obtained were analyzed by breed and age; significance between breed and age difference was found. The conditions of care, management and feeding for the different animals were more or less same during the experiment. The average findings in whole blood samples of 54 Murrah she-buffaloes were as following : Erythrocytes 5.43 million/cu. mm., Hemoglobin 9.87 gm/100 ml. of blood, PCV 31.18 p.c., MCV 57.49 cu. microns, MCH 18.23 micromicrograms, MCHC 31.56 p.c., ESR 73 mm/hr. and total leukocyte count 7370.35/cu. mm. The average findings in whole blood samples of seven Monipuri she-buffaloes were as follows: Erythrocyte 5.35 million. /cu. mm., Hemoglobin 10.37 gm/100 ml. of blood, PCV 32.08 p.c., MCV 59.96 cu. microns, MCH 12.08 micromicrograms, MCHC 32.3 p.c., ESR 87.8 mm/hr, and total leukocyte count 7442.67/cu. mm. A combined evaluation of both the studies including a total of sixty one Murrah and Monipuri she-buffaloes placed the average normal count at 5.39 million. /cu. mm., Hemoglobin concentration at 10.72 gms/100 ml. of blood, average normal PCV at 31.63 p.c., average normal MCH at 18.80 micromicrograms, average normal MCHC at 31.94 p.c., average ESR at 80.13 mm/hr, and total leukocyte count 7500/cu. mm.

Vet. Sci. 133 Tahir, S. U. and M. Ahmed. 1968. **Oestrogenic activity of berseem hay (*Trifolium alexandrinum*).** *Pakistan J. Vet. Sci.* 2(4) : 192-199.

Oestrogenic compound were extracted according to a standard chemical technique and bioassay procedure was adopted to measure their activity. Number of female mice of 21 days old and 8-10 gm. By weight were injected subcutaneously with various levels of diethylstilboestrol in the 1st experiment and with 3 and 6 gms. of hay extract in the 2nd experiment. The comparison of uterine weight of the extract and diethylstilboestrol injected mice indicated that 3 and 6 gm. of hay extract have their potency somewhere in the range of 0.02 and 0.04 kg. level of diethylstilboestrol. These amounts, therefore, were used for the estimation of oestrogenic activity (3 and 6 gm. of hay extract and 0.02, 0.04 kg. of diethylstilboestrol) and one gram of Berseem hay was found to contain 0.0037 ug. of diethylstilboestrol equivalent oestrogenic activity with fiducial limits of 0.0029 and 0.0044 ug. at 5 per cent level.

Vet. Sci. 134 Hossain A. S. K. E., S. U. Ahmed, and A. Ahmad. 1969. **A preliminary study of normal temperature of the buffalo in East Pakistan.** *Pakistan J. Vet. Sci.* 3(1) : 12-16.

Investigation on the normal temperature and its variation in buffaloes of East Pakistan were carried out with seventy Murrah and Monipuri breeds. Diurnal variation and the effect of wallowing were also studied. The average normal temperature was found to be 100°F. The lowest and the highest temperature were recorded to be 97.5°F. and 102°F. respectively. Differences in the individual buffaloes in their daily variation had been observed. To

determine the diurnal variation, observations were made for successive three months, recording the temperature of each group of buffaloes at different times of day. It was observed that the diurnal variation in the individual buffalo rarely exceeds 1.8°F. The results of this diurnal variation do not coincide with the statement of most authors that the temperature is lowest early in the morning. Wallowing in their accustomed manner was observed to have little decreasing effect on the temperature of buffaloes.

Vet. Sci. 135 Hossain, A. S. K. E. and S. U. Ahmed. 1969. **Studies on pulse rate and respiratory frequency in buffaloes.** *Pakistan J. Vet. Sci.* 3(2) : 61-64.

Observations have been made on seventy pure bred Murrah and Monipuri she-buffaloes of the East Pakistan Agricultural University Dairy Farm to find out the normal pulse rate and respiratory frequency. They were divided into 14 groups of 5 buffaloes. Each group was studied for five times. The animals were in good condition and their age varied from 2-11 years. Average pulse rate of buffaloes has been found to be 48 per minute with a range of 42-54 per minute. Young buffaloes observed to have faster pulse rate than the influence of age on the pulse rate. Average respiratory frequency of buffaloes has been found to be 16 per minute with a range of 12-20 per minute. The relationship of the respiratory frequency to the pulse rate has been observed in normal buffaloes at rest. The ratio between respiratory frequency and pulse rate has been observed to vary from 1:3 to 1:4 in buffaloes.

Vet. Sci. 136 Hossain, A. S. K. E., S. U. Ahmed, S. M. Mohiuddin, M. A. Maleque, and A. Ahmad. 1969. **Observations on the blood picture of the Chittagong cattle.** *Pakistan J. Vet. Sci.* 3(2) : 48-53.

Twenty five animals (male and female) of indigenous Chittagong cattle of East Pakistan Agricultural University Dairy Farm were used in a preliminary study on the findings in whole blood samples in male were as follows : RBC 4.83 ± 0.64 million per cu.mm., WBC 8.28 ± 1.48 thousand/cu.mm., Hemoglobin 7.70 ± 0.89 G%, ESR 1.00 ± 0.01 mm/hr, PCV $30.20 \pm 3.67\%$, MCV 63.00 ± 5.21 cu.microns, MCH 16.00 ± 1.63 micromicrogram, Neutrophils $21.20 \pm 5.32\%$, Lymphocytes $67.00 \pm 5.68\%$, Monocytes $3.80 \pm 1.08\%$, Eosinophils $6.80 \pm 1.08\%$ and Basophils $1.00 \pm 0.09\%$. The whole blood values in female were RBC 5.27 ± 0.97 million/cu. mm., WBC 7.02 ± 1.16 thousand/cu.mm., Hemoglobin 9.00 ± 1.38 G%, ESR 0.40 ± 0.02 mm/hr, PCV $36.60 \pm 5.16\%$, MCV 69.00 ± 4.92 cu. microns, MCH 16.92 ± 1.42 micromicrograms, MCHC $24.53 \pm 2.31\%$, Neutrophils $25.70 \pm 6.13\%$, Lymphocytes $57.60 \pm 7.05\%$, Monocytes $3.20 \pm 0.67\%$, Eosinophils $11.90 \pm 1.69\%$, Basophils $0.80 \pm 0.047\%$. The apparent differences of blood values were observed in both sexes. However, those differences were found to be insignificant.

Vet. Sci. 137 Hossain, A. S. K. E. and S. U. Ahmed. 1969. **A preliminary study of the normal specific gravity of whole blood, serum and plasma of the buffalo.** *Pakistan J. Vet. Sci.* 3(4) : 144-147.

A study of the normal specific gravity of whole blood, serum and plasma of the buffalo was undertaken in the East Pakistan Agricultural University. Thirty healthy adult she-buffaloes of Murrah breed of the EPAU Dairy Farm were selected and blood samples from each animal were collected from the jugular vein into two clean test tubes. One tube was mixed with anticoagulant solution of potassium oxalate and ammonium oxalate in proportion of nine parts of blood to one part of the solution. The second tube was later decanted and centrifuged to obtain the serum. Plasma was obtained by centrifuging a part of anticoagulated blood. Specific gravity of whole blood, serum and plasma was determined by the copper sulphate solution method. Data obtained were statistically analyzed. Average specific gravity was found to be 1.0526 ± 0.007 for the whole blood, 1.0253 ± 0.004 for the plasma and 1.0245 ± 0.003 for the serum.

Vet. Sci. 138 Nawza, M., M. Ahmed, and M. A. Qazi. 1969. **A preliminary screening of *Calotropis procera* milky juice on the isolated organ of rabbits and on the blood of dogs.** *Pakistan J. Vet. Sci.* 3(3) : 132-137.

The study was designed to screen the pharmacological action of milky juice of *Calotropis procera* on isolated organs of rabbit and on the blood of dogs. Studies on isolated tissues (duodenum, ileum and heart) of rabbits revealed that the higher doses of diluted juice had spasmodic action on the intestinal smooth muscles while water extract caused relaxation of these muscles. Lower doses of the diluted juice had inhibitory effect on the force of cardiac contraction, and water extract also decreased the rate and force of cardiac contraction, and still higher doses had lethal effect on the cardiac smooth muscles. *In vitro* studies on the blood of dog revealed that juice neither caused hemolysis nor it altered the coagulation time of blood.

Vet. Sci. 139 Rahman, A. and J. C. Ramge. 1969. **The range of leucocytic response and the persistence of staphylococci organism in bovine udder.** *Pakistan J. Vet. Sci.* 3(3) : 105-109.

Persistence of staphylococci in bovine udder and the leucocytic responses thus produced were studied in 10 cows for a period of 10 weeks. The biochemical tests (coagulase test, hemolytic activity, fermentation of mannitol and pigment production on Chapman stone medium) and Wisconsin mastitis test were used to characterize the different strains of staphylococci and to measure the leucocytic responses respectively. A strain having the same biochemical properties at least on two isolations from the same quarter was compared with the range of leucocytic response. Only one strain and two strains of staphylococci were isolated from 15 and 13 quarters respectively and the leucocytic response in those quarters ranged from 25000 to 2 million per ml. of milk. Three strains and four strains were isolated from 6 and 1 quarter

respectively and the leucocytic response ranged upto 1.5 million. The other 5 quarters were not included as organisms other than staphylococci were isolated.

Vet. Sci. 140 Ahmed, S. and F. Rahman. 1970. **Studies on hematology of cross bred sheep (Lohi x Local).** *21st-22nd Pakistan Sci. Conf. 1 B-26-27.*

23 cross bred sheep of East Pakistan Agricultural University Sheep Farms were used in this study. Blood samples were collected from Jugular vein of the animals in 5 c.c. capacity oxalated vials. The different tests were performed and the hematological values were as follows : RBC 9.33 ± 1.62 millions/cu.mm., WBC 13.34 ± 1.74 thousands/cu.mm. Hemoglobin 9.48 ± 1.35 g. per cent, ESR, 91 ± 6 mm.hr., PCV $32.72 \pm 2.50\%$, MVC 40.86 ± 2.90 cm.microns, MCH 11.83 ± 1.63 micromicrograms, MCHC $29.05 \pm 1.6\%$, Neutrophils $40.00 \pm 3.88\%$ lymphocytes 51.46 ± 3.73 , Eosinophils $3.05 \pm 1.33\%$, Monocytes $4.83 \pm 1.64\%$, Basophils $47 \pm 0.90\%$.

Vet. Sci. 141 Mia, M. A. and R. F. Stephanofilariasis. 1970. **The arterial supply to the salivary glands of the cat.** *Archs-oral Biol. 15 : 1-100.*

Twenty four anatomical dissections of the arterial supply to the salivary glands were made of four male and eight female latex-injected, adult domestic cat heads. The parotid gland received its arterial blood from the parotid arteries and from the branches of the lateral auricular, anterior auricular, masseter, transverse facial and occasionally from the anastomosing branch of the intermediate auricular arteries. The major blood supply to the mandibular and sublingual glands was derived from the glandular branch of the facial artery. Occasionally these glands received their blood supply from the great auricular artery (two cases) and from the external carotid artery (two cases). In another specimen a branch of the parotid artery entered the convex surface of the mandibular gland. The polystomatic part of the sublingual gland was provided with the sublingual gland was provided with small branches from the lateral aspect of the lingual and medial aspect of the sublingual arteries. The zygomatic gland was supplied by two branches of the infraorbital and a small branch of the buccinator artery. The molar gland received its arterial supply mainly from the ventral labial supply mainly from the ventral labial artery. Occasional contribution from the angularis oris, posterior mental, middle mental and massetric arteries were also encountered.

Vet. Sci. 142 Shahidullah, M. and A. Rahman. 1970. **A preliminary study on the serum phosphorus (inorganic) level of local cattle in East Pakistan.** *Bangladesh Vet. J. 4(1-4) : 14-19.*

A preliminary study was made on the serum phosphorus (inorganic) level of local cattle in East Pakistan. A total of 71 young cattle of 2-9 months old and 64 adult cattle of over 1 year old reared under field condition were used. The serum phosphorus level in young animals varied from 2.1 mg. to 4.2 mg. per cent and the average value was 2.96 mg. per cent with a standard deviation of ± 0.686 . The value in adult cattle ranged from 2.4 mg. to 4.5 mg. per

cent and the average value being 3.57 mg. per cent with a standard deviation of ± 0.616 . The serum phosphorous level was found to be significantly higher in adult cattle than in the young ones. This value of adult cattle was found to be low when compared with the serum phosphorus value found in cattle of western countries.

Vet. Sci. 143 Hossain, A. S. K. E. and S. U. Ahmed. 1971. **Seasonal variations of oestrus in buffaloes of Bangladesh.** *Bangladesh Vet. J. 5(1-4) : 47-52.*

A preliminary survey on oestrus in buffaloes maintained by the Bangladesh Agricultural University Dairy Farm and local farmers were collected and statistically analyzed to study the effect of season and certain ecological factors on the breeding activity. It was evident from results that there was definite breeding season in buffaloes although they come to oestrus throughout the year. The period of highest sexual activity was found to be from October to January when 66 p.c. of the buffaloes came to heat. The remaining period was found to be less favourable and the slack season was from May to July when only 6 p.c. of the animals were in heat. The variation due to month and season was found to be significant. Significant correlation was found to exist between certain climatic factors and frequency of oestrus. High atmospheric temperature seemed to have suppressive effect on the breeding activity in buffaloes. Humidity alone was found to have little influence on the occurrence of oestrus in buffaloes. Rainfall was found to have no influence. Thus it appeared that the variation in climate due to season was responsible for variation in the breeding activity of buffaloes, while lesser part was played by other factors.

Vet. Sci. 144 Hossain, A. S. K. E. 1971. **Oestrus in sheep.** *Proc. 23rd. All Pakistan Sci. Conf.*

A total of 474 records on oestrus in sheep maintained by the EPAU farm were obtained from the Artificial Insemination records for the period 1965 to 1970. These collected data were statistically analyzed to study the effect of month, season and certain climatic factors on the breeding pattern. Weather data for the corresponding period was obtained from the nearby Physics Laboratory of the East Pakistan Agricultural University. Three seasons were defined in the study viz. (1) Winter (November to February), (2) Summer (March to June), and (3) Fall (July to October), depending on the climate prevalent in the area. It was observed that the occurrence of oestrus was highly variable with highest and lowest frequencies during the months of July (17.5 p.c) and April (2 p.c.) respectively. The period of highest sexual activity was during July through February, when 75 p.c. of the sheep came to heat, and that of lowest sexual activity was during March through June when only 25 p.c. of the animals showed heat. The variation between months and seasons in the frequency of oestrus was tested for significance. There was significant correlation between certain climatological factors and frequency of oestrus. High ambient temperature and high breeding activity were found to be inversely related and the relation was statistically significant.

Vet. Sci. 145 Hossain, A. S. K. E. 1971. **Effect of month, season and certain climatic factors on oestrus in indigenous cows.** *Proc. 23rd. All Pakistan Sci. Conf.*

Six thousand nine hundred eighty eight records on oestrus in indigenous cows maintained by farmers were obtained from the Artificial Insemination records of East Pakistan Agricultural University centre for the period 1964 to 1970. The collected data were statistically analyzed to study the effect of month, season and certain climatological factors on the breeding pattern in indigenous cows. The animals under study were purely from village conditions, and from different levels of nutrition and management. Weather data for the corresponding period were obtained from the nearby Physics Laboratory of the East Pakistan Agricultural University. Three seasons were described in the study. Three seasons were described in the study viz. (1) Winter (November to February), (2) Summer (March to June) and (3) Fall (July to October), depending on the climate prevalent in the area. Results indicated that there was definite breeding season in indigenous cows although they come to oestrus throughout the year. The period from December to February appeared to be more favourable. The period from April to July appeared to be less favourable and the slack season was found to be from August to November when only 4-6 p.c. cows were found in heat. The variation due to month and season was significant. High ambient temperature and high breeding activity were found to be inversely related, and the relation was statistically significant. Monthwise distribution of oestrus was found to be as follows : January 10.5 p.c., February 11.1 p.c., March 12.6 p.c., April 8.9 p.c., May 9.8 p.c., June 7.6 p.c., July 7.1 p.c., August 4.7 p.c., September 5.4 p.c., October 5.7 p.c., November 6.2 p.c. and December p.c.

Vet. Sci. 146 Gaffur, M. A., Q. Hasan and S. U. Ahmed. 1972. **Action of total alkaloid (s) from holarrhena antidysenterica wall (Beng-Kurchi) on blood of dogs.** *Bangladesh Vet. J. 6(1-4) : 31-38.*

The alkaloid (s) were extracted from Halarrhena Antidysenterica Wall by modified 9 p.c. gravimetric method and with Soxhlet apparatus. The alkaloids in the extract were detected by precipitation test, spot test and paper-chromatography. The action of the total extract was studied on blood of 42 indigenous dogs in graded dose response method. The total extract gradually decreased the erythrocyte counts with the gradual increase of doses, the maximum decrease being recorded 15 hours after the administration of 8 mg/kg body weight of drug. The hemoglobin value was also decreased with the increase of doses. The packed cell volume decreased after 3 hours following the administration of the total extract but it returned back to normal range with the passage of time. The decrease of erythrocyte counts, hemoglobin value and packed cell volume might be due to depressive action on the reticuloendothelial system.

Vet. Sci. 147 Hossain A. S. K. E. 1973. **Coagulation time of the buffalo blood.** *Part of Ph. D. Thesis, Bangladesh Agr. Univ. (MS). 58.*

Examinations of the blood of forty seven buffalo calves and sixty adult buffaloes carried out to find the normal coagulation time. Studies on the calves were made from their birth to 12 months of age. All the animals were apparently healthy. During the first year of life of the buffalo calves, the coagulation times were found to be distributed between 3.0 to 7.5 minutes with the mean value of 5.5 ± 0.32 minutes. A wider range of 2.5 to 12.0 minutes with the mean value of 6.5 ± 0.61 minutes was recorded for the adult buffaloes. Buffalo calves had a

faster rate of coagulation when compared with the adults, and this has been especially observed in the early days of life, probably due to the stress associated with birth. Significant differences ($P = <0.001$) were found in coagulation times during various seasons of the year. Distinct tendency for increasing coagulation time of calves' blood was observed from birth to the age of 10 months. Between the age of 1 and 2 years the blood again began to take longer time to coagulate. Coagulation time has not been found to vary between breeds. Seasonal variations have also been observed to effect the coagulation time of the buffalo blood. The coagulation time was observed to increase during the first four months of gestation after which no variations occurred. Coagulation of the blood was found to occur much quicker after parturition.

Vet. Sci. 148 Maleque. M. A. 1973. **Extraction of alkaloid from *Holarrhena antidysenterica* wall and its effect on respiratory frequency in the anaesthetised dog.** *Bangladesh J. Vet. Sci.* 5(1-4) : 5-13.

Total extract of alkaloids from *Holarrhena antidysenterica* (Beng.-Kurchi) was obtained with ether and ether chloroform mixture by gravimetric method and was taken up as 0.1% solution in distilled water. Presence of alkaloid in the total extract was detected and confirmed by (a) precipitation test (b) spot test and (c) paper chromatography technique. Results of precipitation test exhibited highly positive response. The distinct red spot developed in a filter paper on a pale orange background in spot test was compared with those developed by known alkaloids viz; atropine and rauwolfia. The spot developed in paper chromatography was compared with those developed by known alkaloids viz; atropine, pilocarpine and quinin. In the total extract obtained in this study, there is an indication of presence of more than one alkaloids by the nature of the spots developed in the ascending paper chromatography with very close Rf. values. The mean initial respiratory frequency before administration of drug was 16.83 ± 4.32 . Following administration of total extract, the respiratory frequency per minutes was 17.50 ± 3.10 . The difference was insignificant. A comparative study of total extract with acetylcholine and histamine indicated the apparent increase of respiratory frequency after administration of each drug but the difference was found insignificant. The effect of the total extract on respiratory frequency in this investigation showed similar responses produced by acetylcholine and histamine.

